



ALGORITHMS



USMAN SAEED

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1. Cardiovascular system

Medicine

Factors associated with poor outcome after witnessed out-of-hospital sudden cardiac arrest

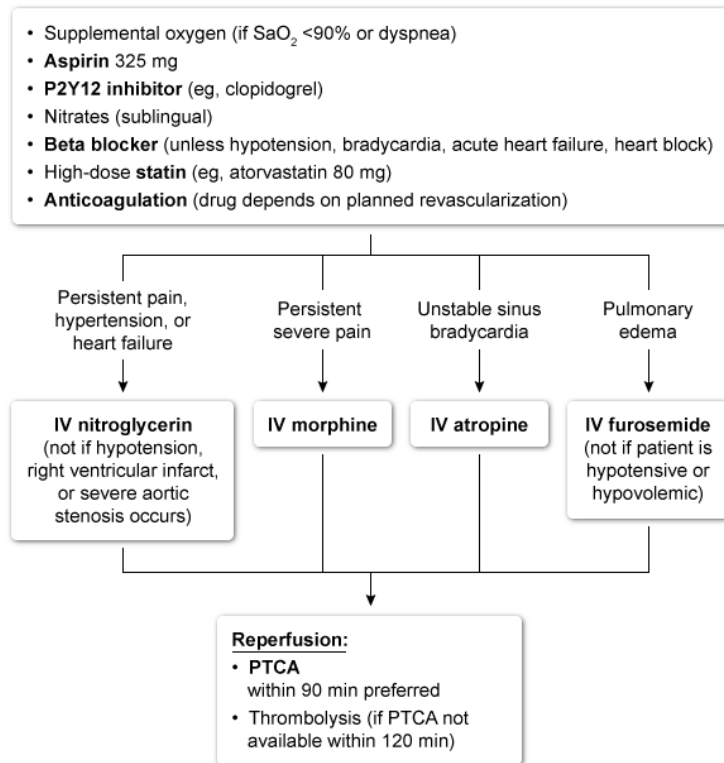
Factors associated with poor outcome after witnessed out-of-hospital sudden cardiac arrest	
<ul style="list-style-type: none"> • <u>Time elapsed prior to effective resuscitation (delayed bystander CPR, delayed defibrillation)</u> • Initial rhythm of pulseless electrical activity or asystole • <u>Prolonged CPR (>5 min)</u> • Absence of vital signs • Advanced age • History of cardiac disease • ≥2 Chronic illnesses • Persistent coma after CPR • <u>Need for intubation or vasopressors</u> • Pneumonia or renal failure after CPR • Sepsis, cerebrovascular accident, or class III or IV heart failure 	
CPR = cardiopulmonary resuscitation.	

Lifestyle interventions for HTN

Lifestyle interventions for hypertension		
Modification	Recommended plan	Approximate ↓ systolic BP (mm Hg)
DASH diet	Diet high in fruits & vegetables & low in saturated & total fats	11
Weight loss	Reduction of BMI to <25 kg/m ²	6 per 10-kg loss
Aerobic exercise	30 minutes/day for 5+ days/week	7
Dietary sodium	<1.5-2.3 g/day (response varies)	5-8
Alcohol limitation	≤2 drinks/day in men, ≤1 drink/day in women	5
DASH = Dietary Approaches to Stop Hypertension.		

Acute ST-elevation MI

Initial stabilization of acute ST-elevation MI

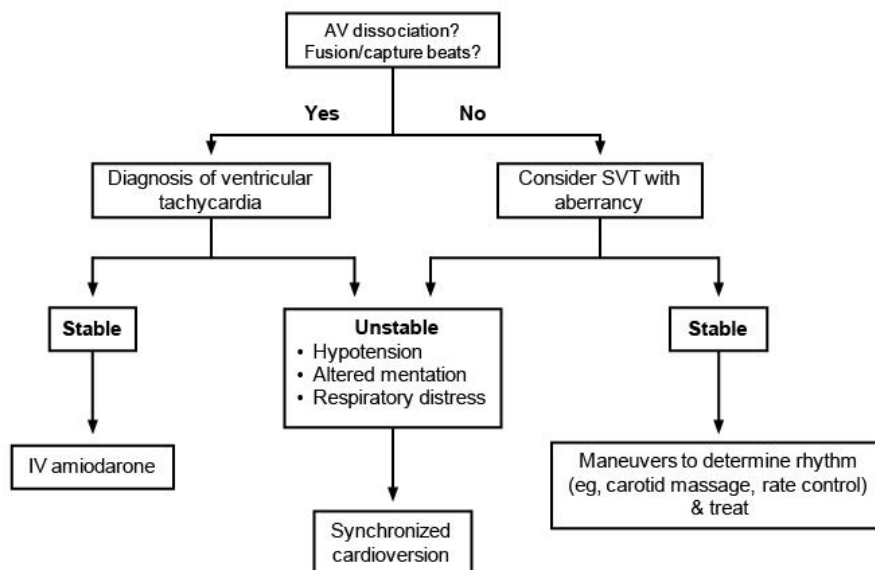


IV = intravenous; PTCA = percutaneous transluminal coronary angioplasty.

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Wide complex tachycardia

Approach to wide-complex tachycardia



AV = atrioventricular; IV = intravenous; SVT = supraventricular tachycardia.

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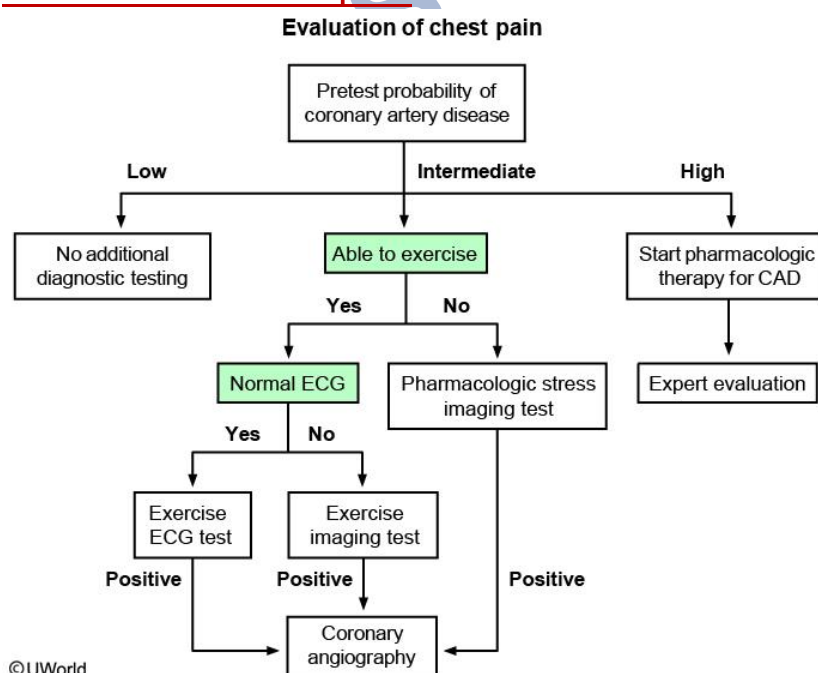
Abdominal aortic aneurysm screening

Screening: abdominal aortic aneurysm	
Patient population	<ul style="list-style-type: none"> Men Age 65-75
Risk factor indication	<ul style="list-style-type: none"> Any smoking history
Test	<ul style="list-style-type: none"> One-time abdominal duplex ultrasonography

Pretest probability for coronary artery disease

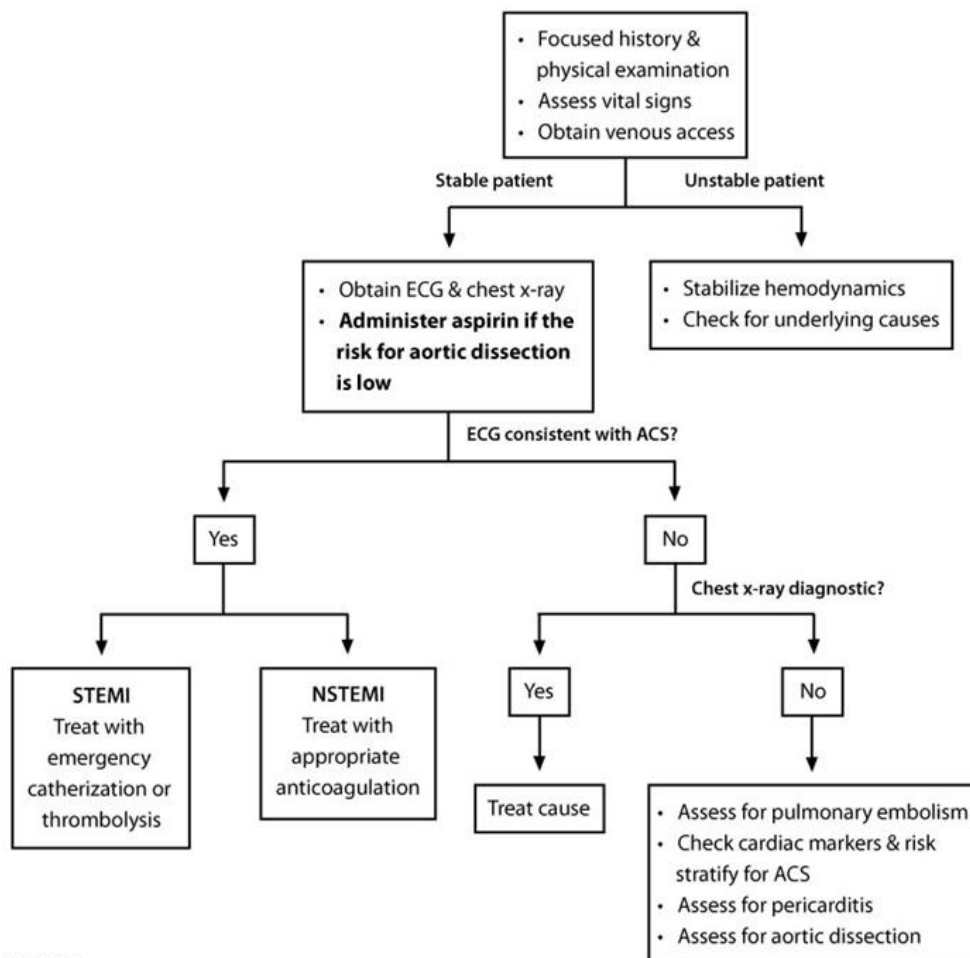
Pretest probability of coronary artery disease	
Low (<10%)	<ul style="list-style-type: none"> Asymptomatic people of all ages Atypical chest pain in women age <50
Intermediate (20%-80%)	<ul style="list-style-type: none"> Atypical angina in men of all ages Atypical angina in women age ≥50 Typical angina in women age 30-50
High (>90%)	<ul style="list-style-type: none"> Typical angina in men age ≥40 Typical angina in women age ≥60

Evaluation of chest pain



Evaluation of chest pain in ER

Evaluation of chest pain in the emergency department



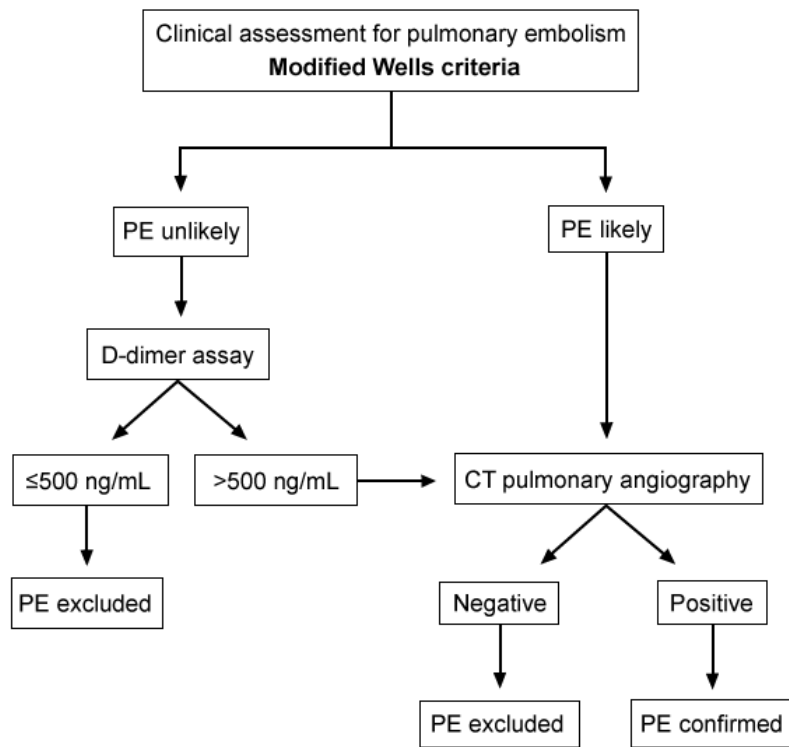
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Pretest probability for pulmonary embolism

Modified Wells criteria for pretest probability of pulmonary embolism	
+3 points	<ul style="list-style-type: none"> Clinical signs of DVT Alternate diagnosis less likely than PE
+1.5 points	<ul style="list-style-type: none"> Previous PE or DVT Heart rate >100 Recent surgery or immobilization
+1 point	<ul style="list-style-type: none"> Hemoptysis Cancer
Total score	<ul style="list-style-type: none"> ≤4 = PE unlikely >4 = PE likely
DVT = deep vein thrombosis; PE = pulmonary embolism.	

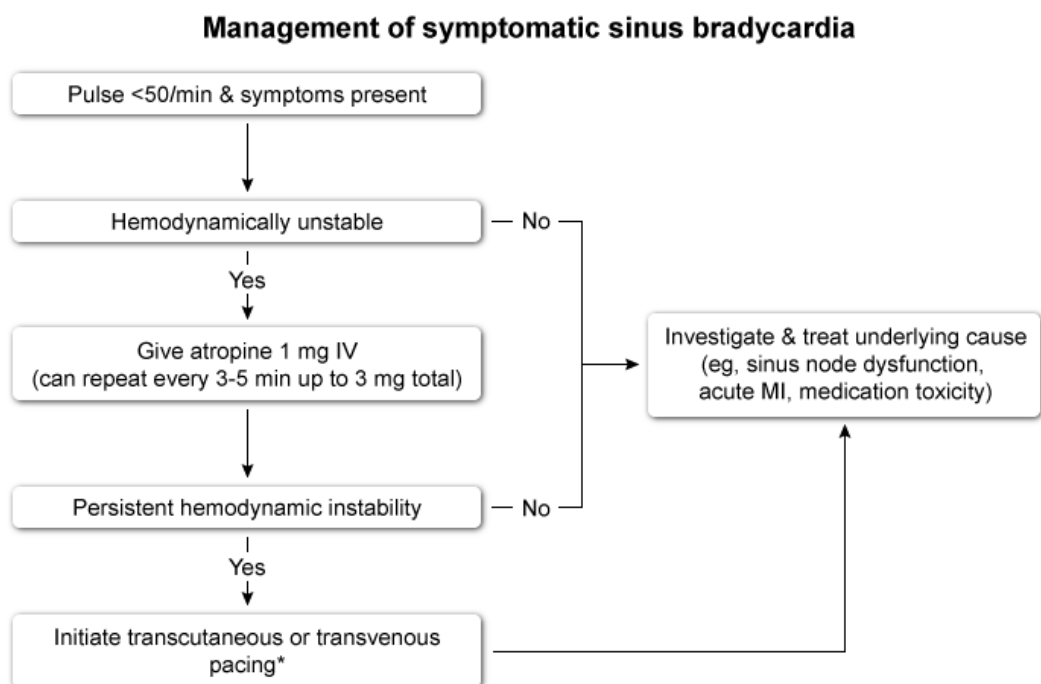
Suspected pulmonary embolism

Diagnostic strategy in suspected pulmonary embolism



PE = pulmonary embolism.
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Management of symptomatic sinus bradycardia



*IV infusion of dopamine 5-20 mcg/kg/min or epinephrine 2-10 mcg/min may also be attempted prior to temporary pacing.
IV = intravenous; MI = myocardial infarction.

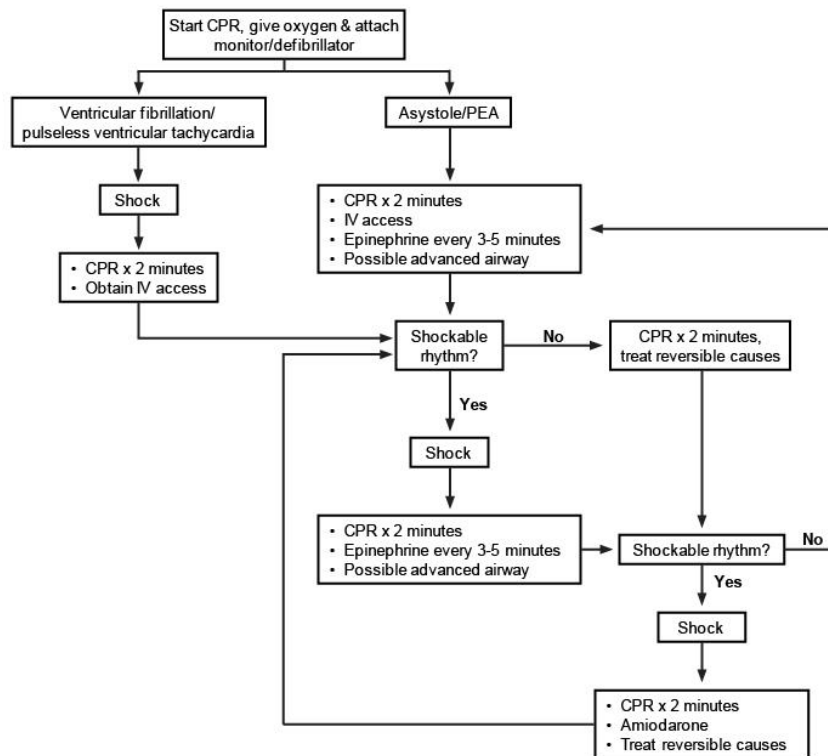
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Diagnosis of anaphylaxis

Diagnostic criteria for anaphylaxis	
Anaphylaxis is likely if there is rapid symptom onset & any 1 of the following criteria:	
1	Skin/mucosa involvement (eg, hives, lip/tongue swelling) & either hypotension or respiratory distress
2	Involvement of ≥2 organ systems after exposure to a likely allergen <ul style="list-style-type: none"> • Skin/mucosa (eg, hives, lip/tongue swelling) • Respiratory (eg, wheezing, stridor, dyspnea) • Cardiovascular (eg, hypotension, tachycardia, syncope) • Gastrointestinal (eg, abdominal pain, vomiting, diarrhea)
3	Hypotension after exposure to a known allergen

Approach to adult cardiac arrest

Approach to adult cardiac arrest

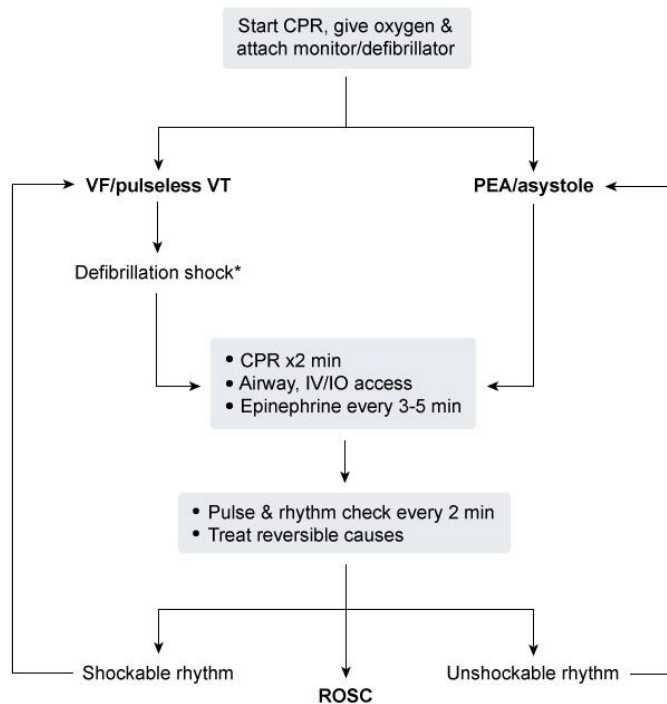


CPR = cardiopulmonary resuscitation; PEA = pulseless electrical activity.

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Adult cardiac arrest management

Approach to adult cardiac arrest



*Amiodarone given after 3rd defibrillation shock.

IO = intraosseous; IV = intravenous; PEA = pulseless electrical activity; ROSC = return of spontaneous circulation; VF = ventricular fibrillation; VT = ventricular tachycardia.

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CHA₂DS₂-VASc score for thromboembolic risk in nonvalvular atrial fibrillation

CHA ₂ DS ₂ -VASc score for thromboembolic risk in nonvalvular atrial fibrillation					
Risk criteria			Points		
C	Congestive heart failure		1		
H	Hypertension		1		
A ₂	Age ≥75*		2		
D	Diabetes mellitus		1		
S ₂	Stroke or TIA		2		
V	Vascular disease (eg, PAD, prior MI)		1		
A	Age 65-74*		1		
Sc	Sex category female**		1		
	Maximum score		9		
Total score		Generalized stroke risk	Antithrombotic therapy		
Male	Female				
0	0			Low	None
1	2			Moderate	None or oral anticoagulant
≥2	≥3			High	Oral anticoagulant

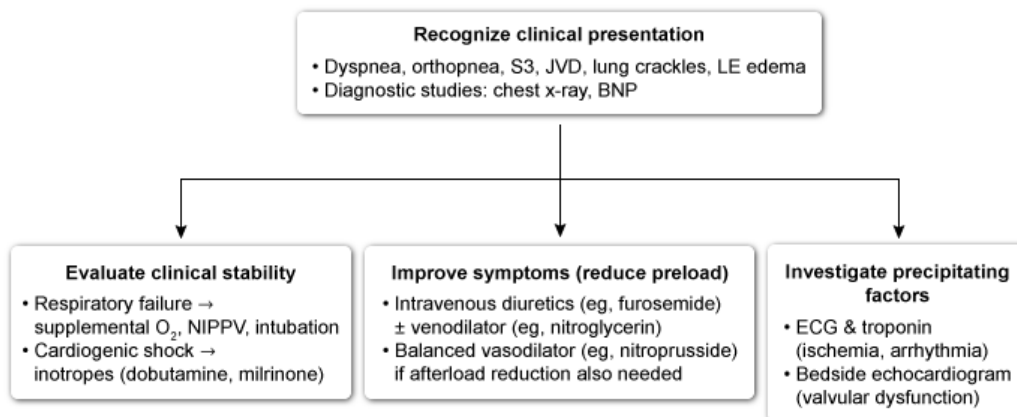
*Patients are assigned to 1 of the 2 age categories.

**Different cutoffs are used for males & females because female sex is considered a risk modifier that adds to the CHA₂DS₂-VASc score only if other (nonsex) risk factors are present.

MI = myocardial infarction; PAD = peripheral artery disease; TIA = transient ischemic attack.

Management of Acute decompensated heart failure

Initial management of acute decompensated heart failure



BNP = brain natriuretic peptide; JVD = jugular venous distension; LE = lower extremity; NIPPV = noninvasive positive pressure ventilation.

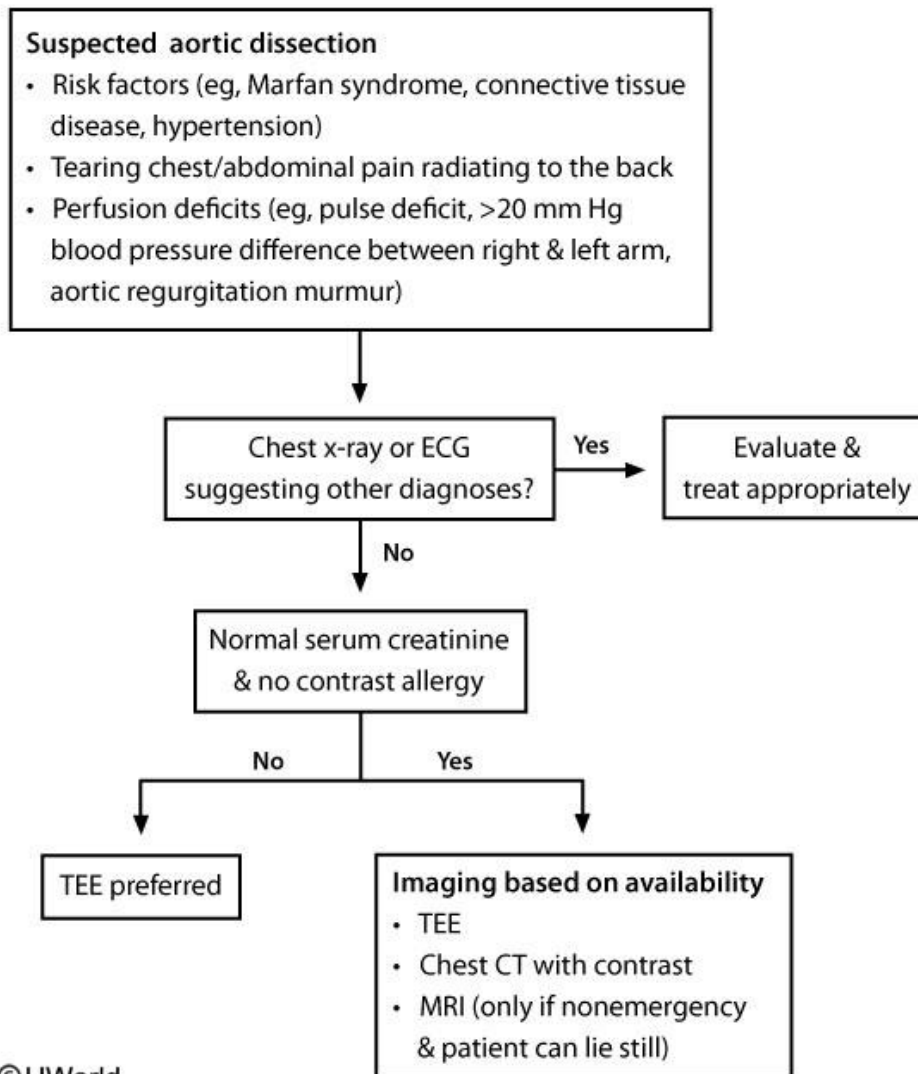
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Management of hypertriglyceridemia

Treatment of hypertriglyceridemia			
Triglycerides	150-499 mg/dL	500-999 mg/dL	≥1,000 mg/dL
General measures	<ul style="list-style-type: none"> Limit dietary sugar/tight glycemic control in diabetes Limit saturated fat Regular aerobic exercise Weight loss of 5%-10% of body weight Treat with statins based on ASCVD risk 		
Specific measures	<ul style="list-style-type: none"> Limit alcohol intake Ω-3 acids if high risk of ASCVD 	<ul style="list-style-type: none"> Abstain from alcohol Ω-3 acids or fibrates, depending on ASCVD risk 	<ul style="list-style-type: none"> Abstain from alcohol Fibrates to reduce pancreatitis risk
ASCVD = atherosclerotic cardiovascular disease; Ω-3 acids = omega-3 fatty acids.			

Diagnostic approach to aortic dissection

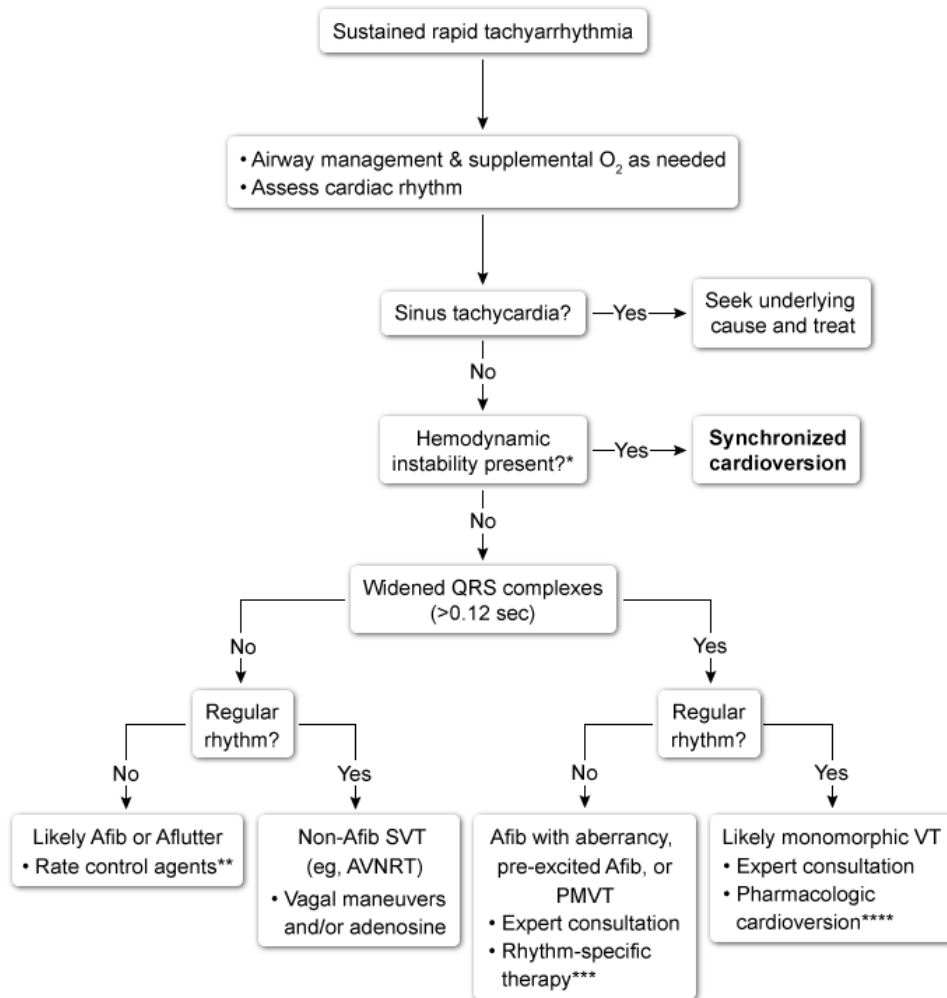
Diagnostic approach for suspected aortic dissection



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Management of adult tachycardia

Management of adult tachycardia with a pulse (ACLS guidelines)



*Hemodynamic instability usually only occurs with heart rate >150/min.

**Beta blocker or nondihydropyridine calcium channel blocker.

***Rate control for Afib with aberrancy, procainamide for pre-excited Afib, magnesium for PMVT.

****Amiodarone, procainamide, lidocaine, or sotalol.

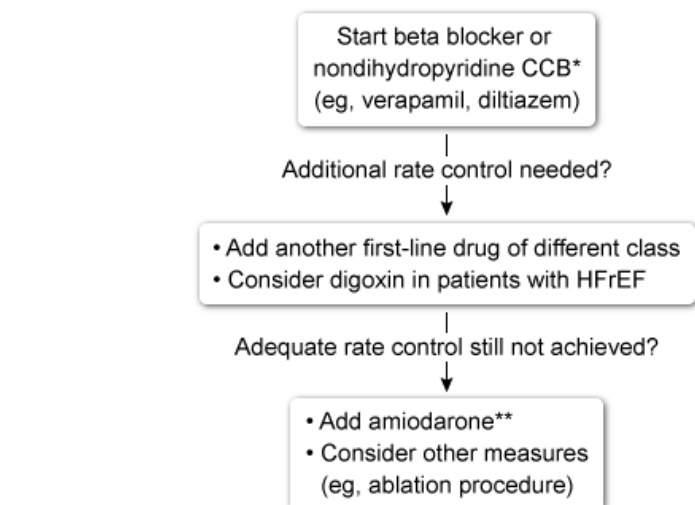
AVNRT = atrioventricular nodal reentrant tachycardia; SVT = supraventricular tachycardia; VT = ventricular tachycardia;

PMVT = Polymorphic ventricular tachycardia.

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Pharmacological rate control of atrial fibrillation

Pharmacologic rate control of atrial fibrillation



* Nondihydropyridine CCBs contraindicated in HFrEF.

** Amiodarone relatively contraindicated in COPD & other chronic lung disease.

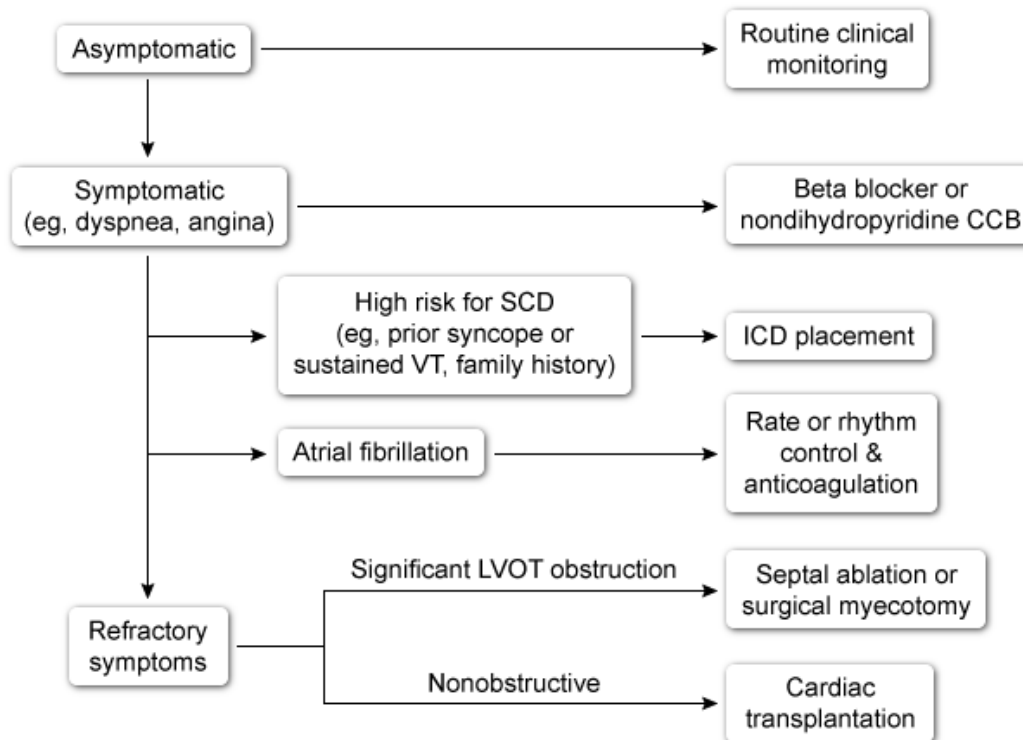
AV = atrioventricular; CCB = calcium channel blocker; COPD = chronic obstructive pulmonary disease;

HFrEF = heart failure with reduced ejection fraction.

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Management of hypertrophic cardiomyopathy

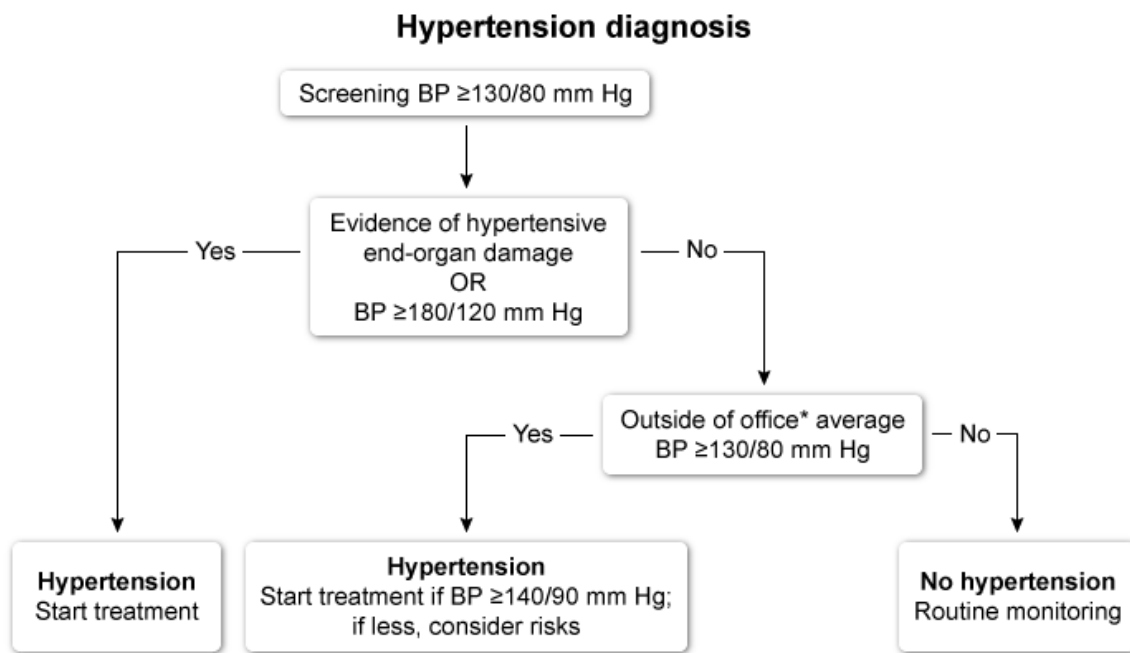
Management of hypertrophic cardiomyopathy



CCB = calcium channel blocker; ICD = implantable cardiac defibrillator; LVOT = left ventricular outflow tract; SCD = sudden cardiac death; VT = ventricular tachycardia.

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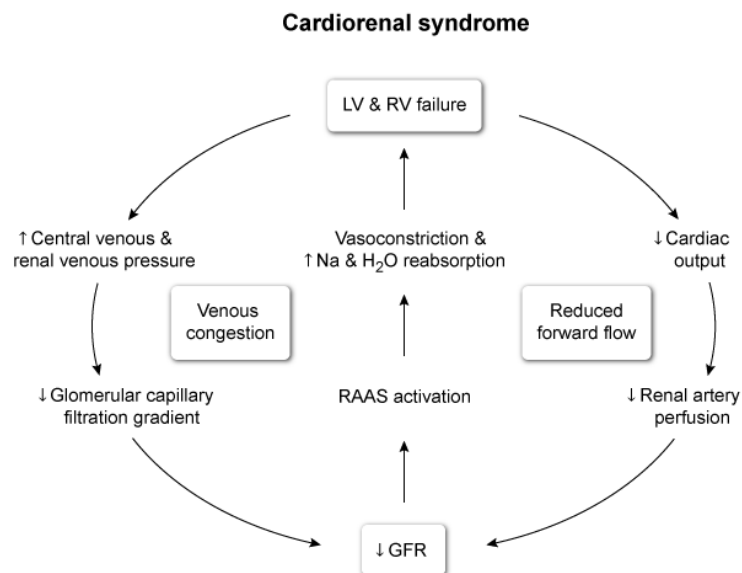
Diagnosis of HTN



*Ambulatory BP monitoring for 24-48 hr or twice-daily home BP monitoring for 1 week.
BP = blood pressure.

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Cardiorenal syndrome



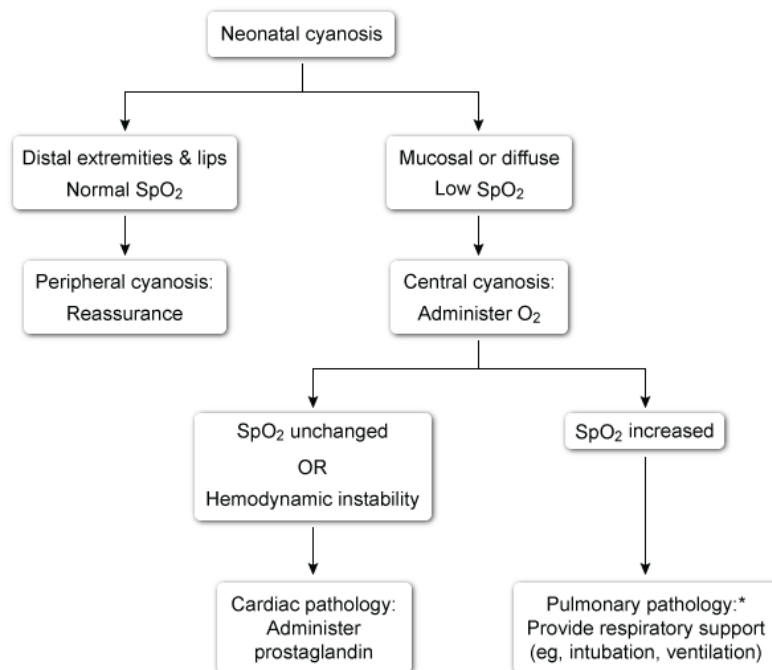
GFR = glomerular filtration rate; LV = left ventricle; RAAS = renin-angiotensin-aldosterone system; RV = right ventricle.

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Paediatrics

Neonatal cyanosis

Approach to neonatal cyanosis



*Consider persistent pulmonary hypertension of the newborn, particularly if differential cyanosis is present.

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Routine newborn care

Routine newborn care	
Preventive	<ul style="list-style-type: none"> Intramuscular vitamin K Erythromycin eye ointment Hepatitis B vaccine
Screening	<ul style="list-style-type: none"> Newborn screen (metabolic/genetic disorders) Hyperbilirubinemia Hearing screen Pre- & post-ductal pulse oximetry (congenital heart disease) Hypoglycemia (select populations)

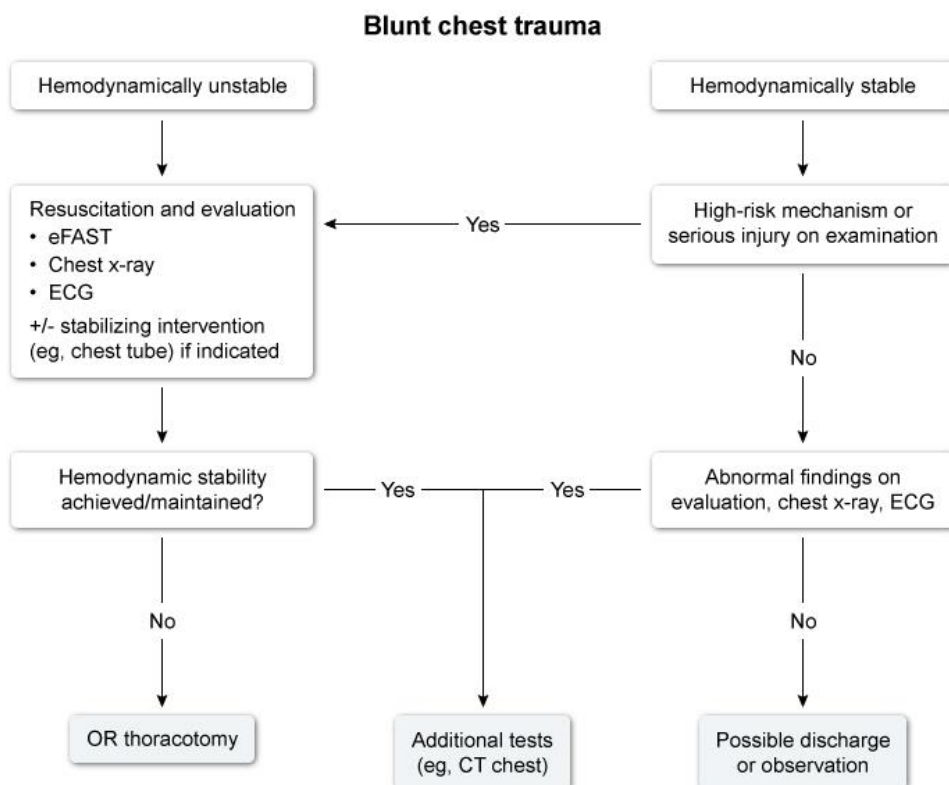
Surgery

Stenotic valve replacement indications

Valve replacement in aortic stenosis	
Severe AS criteria	<ul style="list-style-type: none"> Aortic jet velocity ≥ 4.0 m/sec, or Mean transvalvular pressure gradient ≥ 40 mm Hg Valve area usually ≤ 1.0 cm² but not required
Indications for valve replacement	Severe AS & ≥ 1 of the following: <ul style="list-style-type: none"> Onset of symptoms (eg, angina, syncope) Left ventricular ejection fraction $< 50\%$ Undergoing other cardiac surgery (eg, CABG)

AS = aortic stenosis; CABG = coronary artery bypass grafting.

Blunt chest trauma management

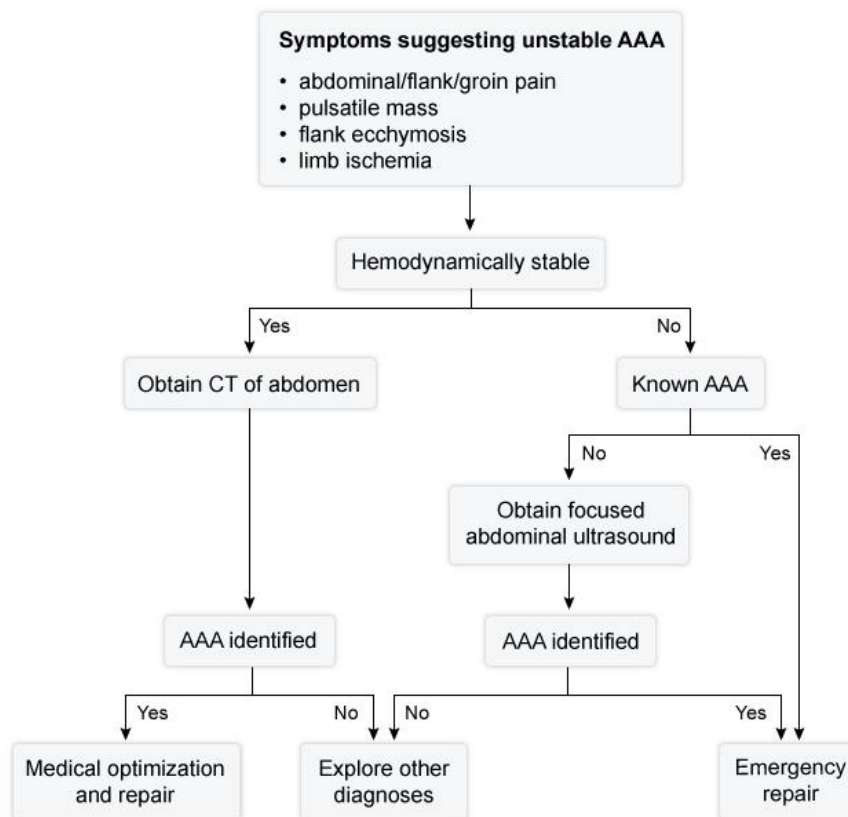


eFAST = extended Focused Assessment with Sonography for Trauma; OR = operating room.

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Evaluation of suspected abdominal aortic aneurysm

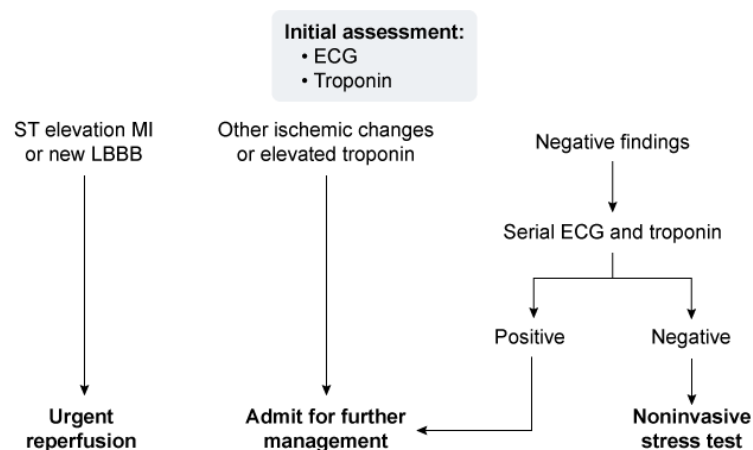
Evaluation of suspected unstable abdominal aortic aneurysm



AAA = abdominal aortic aneurysm.
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Evaluation of suspected acute coronary syndrome

Evaluation of suspected acute coronary syndrome in the emergency department



LBBB = left bundle branch block; MI = myocardial infarction.
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Cardiac risk evaluation for a noncardiac surgery

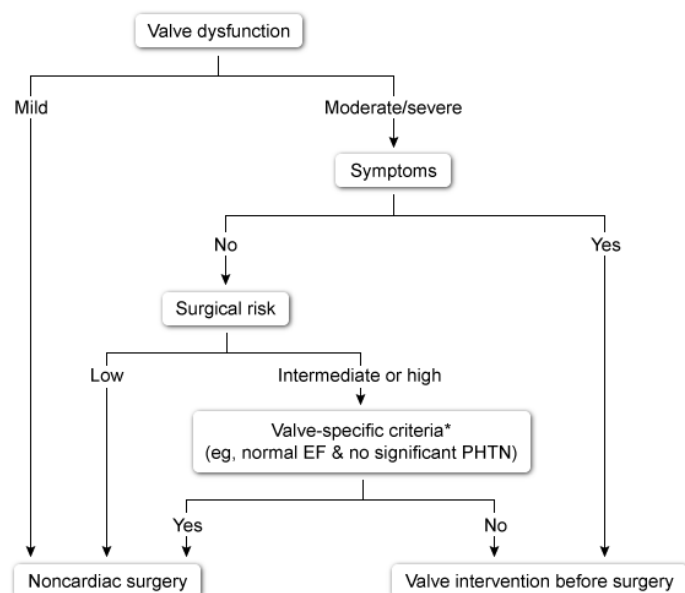
Revised Cardiac Risk Index (RCRI) (cardiovascular risk of noncardiac surgery)	
6 risk predictors	<ul style="list-style-type: none"> • High-risk surgery (eg, vascular, intrathoracic) • Ischemic heart disease • History of congestive heart failure • History of cerebrovascular disease (stroke or TIA) • Diabetes mellitus treated with insulin • Preoperative creatinine >2 mg/dL
Risk of cardiac death, nonfatal cardiac arrest, or nonfatal MI	<ul style="list-style-type: none"> • 0-1 factor: low risk* • ≥2 factors: elevated risk

***RCRI score of 0-1 originally reported as ≤1% and still accepted as low risk. Slightly higher event rates of later studies probably due to using troponins (↑ sensitivity) and including additional outcomes (eg, all-cause mortality).**

MI = myocardial infarction; TIA = transient ischemic attack.

Valvular heart disease management before noncardiac surgery

Valvular heart disease management before noncardiac surgery



*AR/AS = normal EF, MS = no significant PHTN, MR = normal EF & no significant PHTN.
 AR = aortic regurgitation; AS = aortic stenosis; EF = ejection fraction; MR = mitral regurgitation;
 MS = mitral stenosis; PHTN = pulmonary hypertension.

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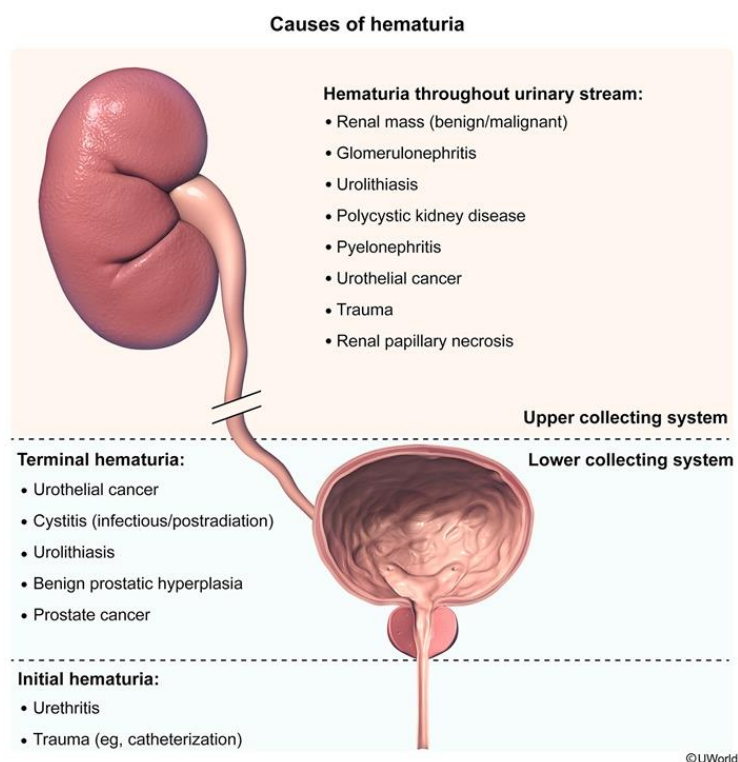
Ankle-brachial index

Ankle-brachial index	
ABI = SBP of dorsalis pedis or posterior tibial artery ÷ SBP of brachial artery	
≤0.9	Diagnostic of peripheral artery disease
0.91-1.3	Normal
>1.3	Suggests calcified & uncompressible vessels*
*Other testing should be considered.	
ABI = ankle-brachial index; SBP = systolic blood pressure.	

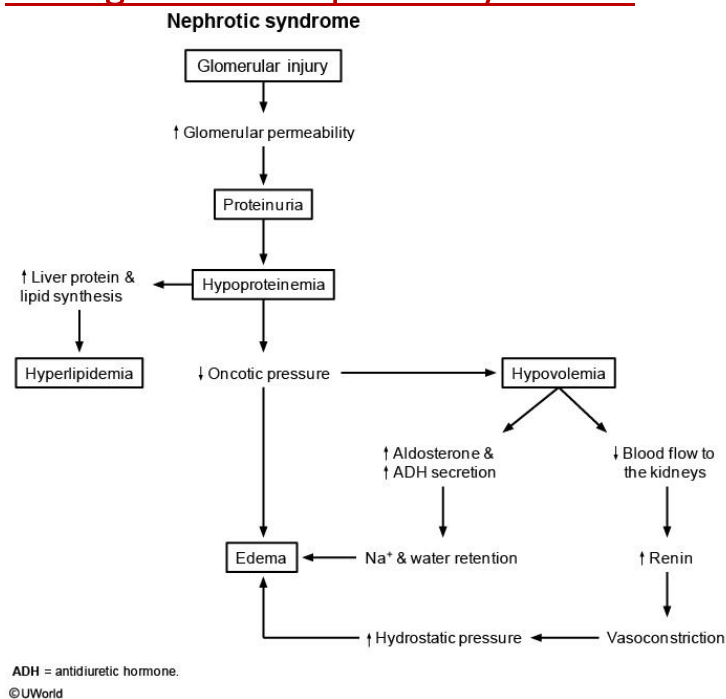
2. Renal

Medicine

Causes gross hematuria

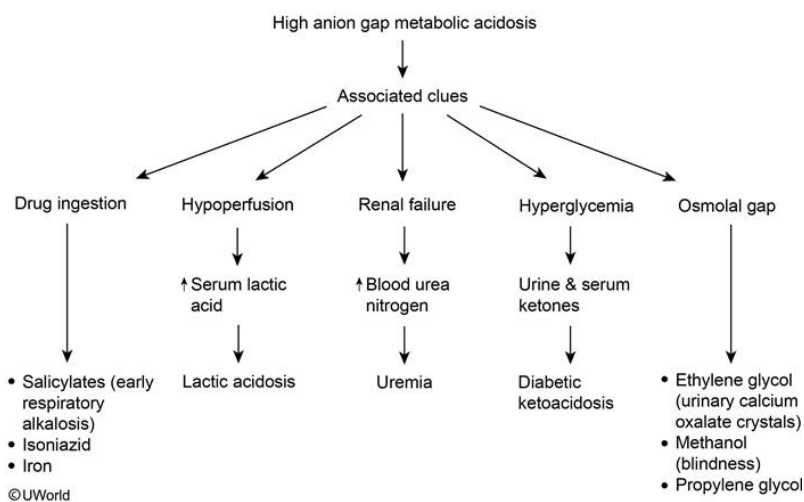


Pathogenesis of nephrotic syndrome

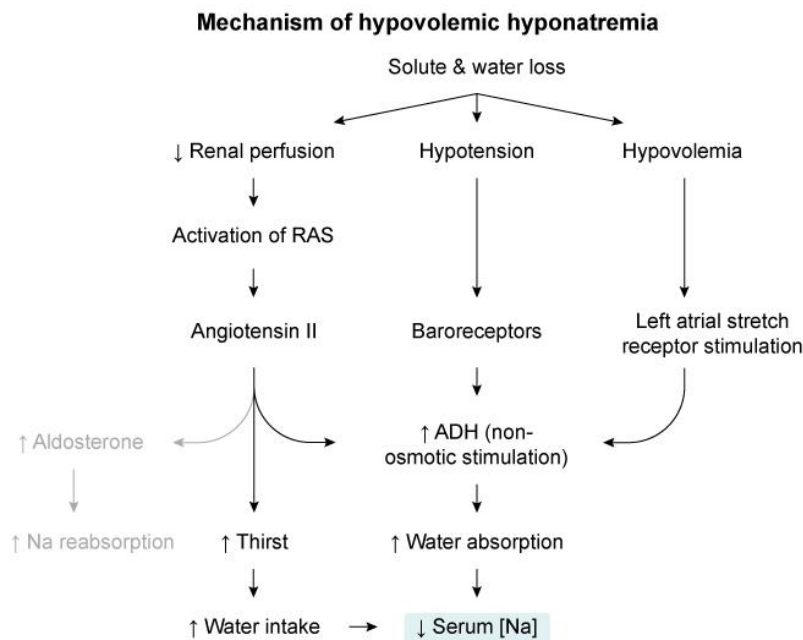


Workup for AGMA

Workup of high anion gap metabolic acidosis



Mechanism of hypovolemic hyponatremia

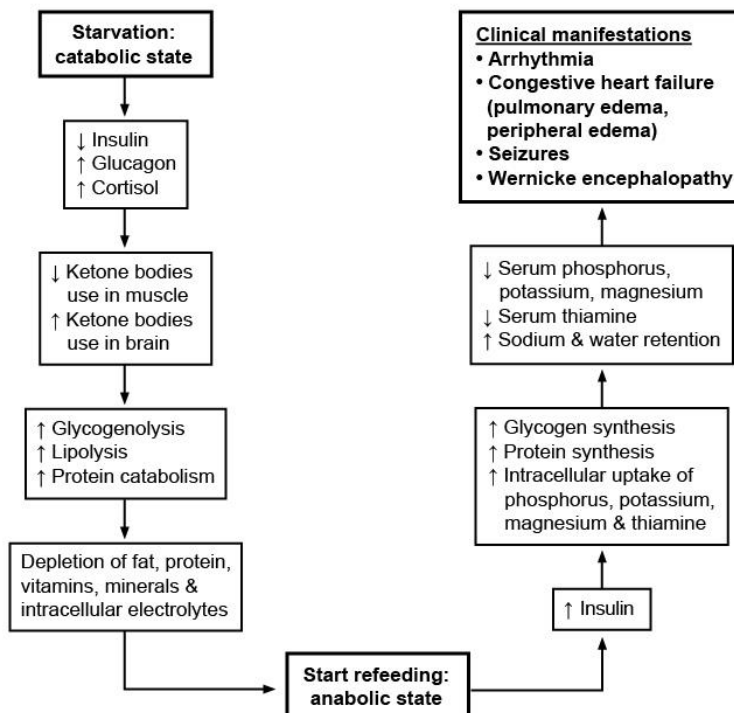


ADH = antidiuretic hormone; Na = sodium; RAS = renin-angiotensin-aldosterone system.

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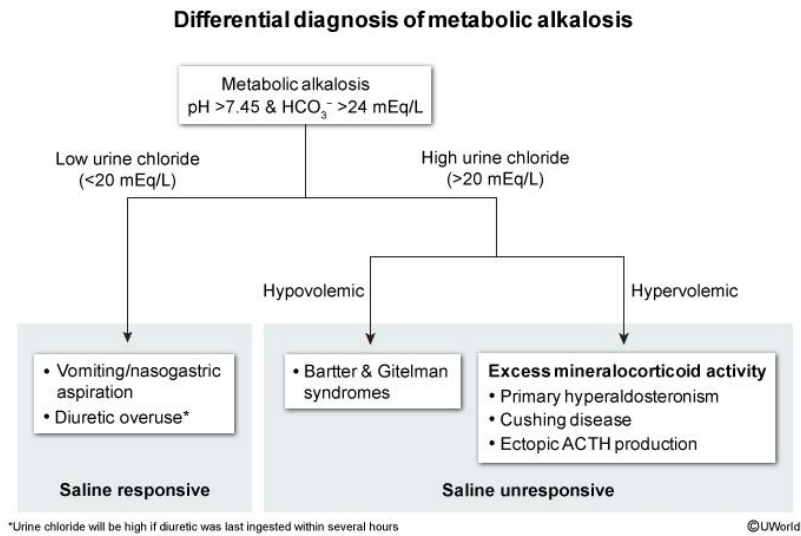
Refeeding syndrome

Pathogenesis of refeeding syndrome

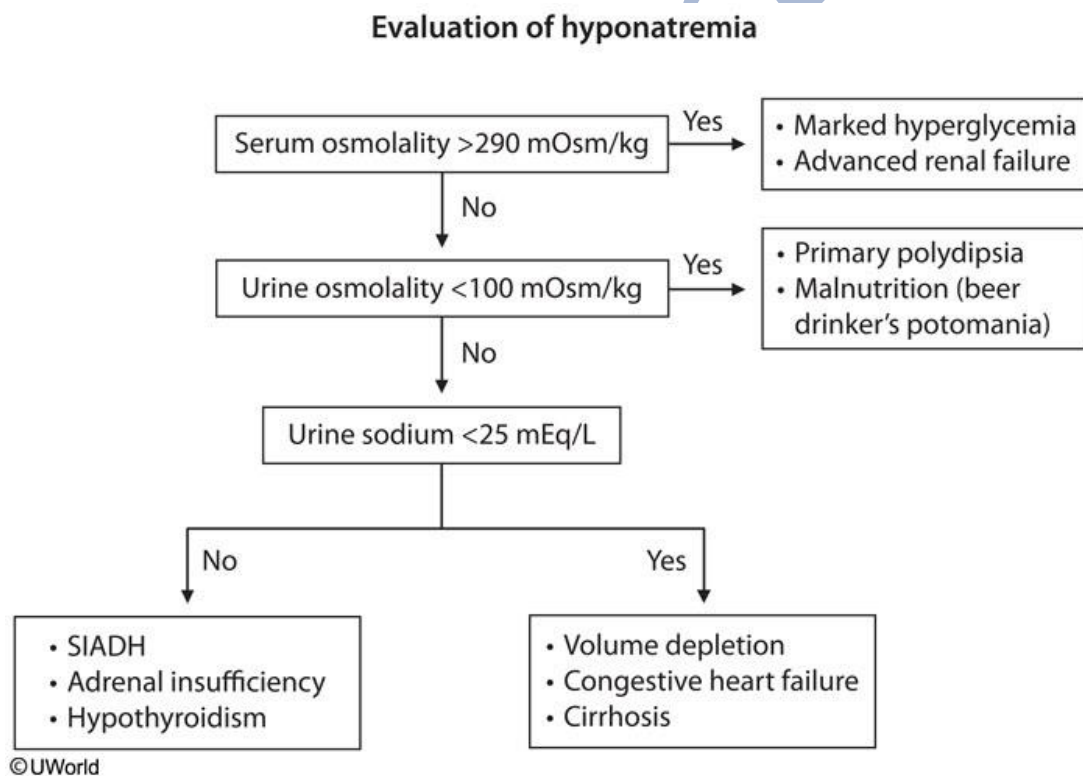


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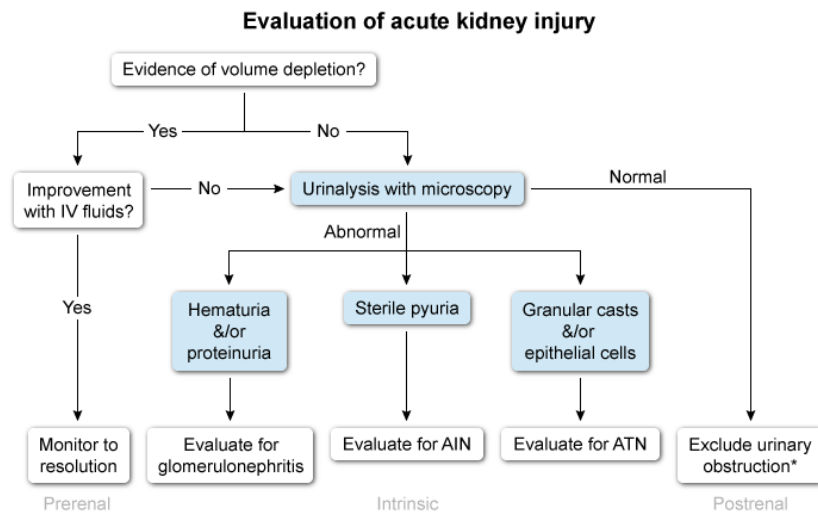
Differential diagnosis of metabolic alkalosis



Evaluation of hyponatremia



Evaluation of AKI



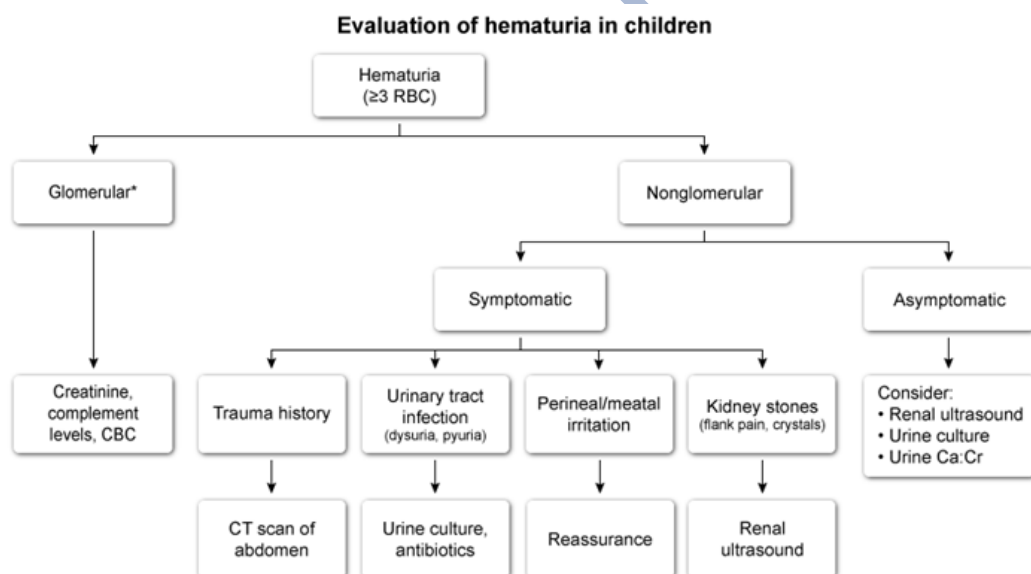
*Renal ultrasonography.

AIN = acute interstitial nephritis; ATN = acute tubular necrosis; IV = intravenous.

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Paediatrics

Evaluation of hematuria in children

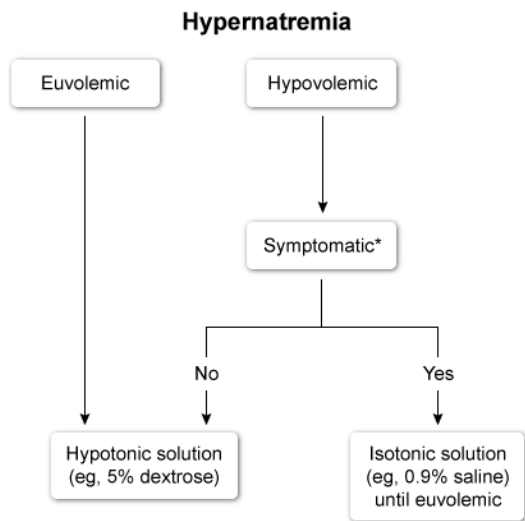


*Findings of glomerular disease include brown urine, edema, hypertension, proteinuria, and RBC casts.

Ca:Cr = calcium to creatinine ratio; CBC = complete blood count; RBC = red blood cell.

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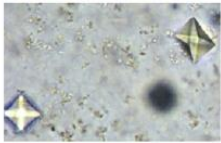
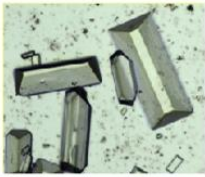


Hypernatremia



*Tachycardia, decreased blood pressure, dry mucous membranes, delayed capillary refill

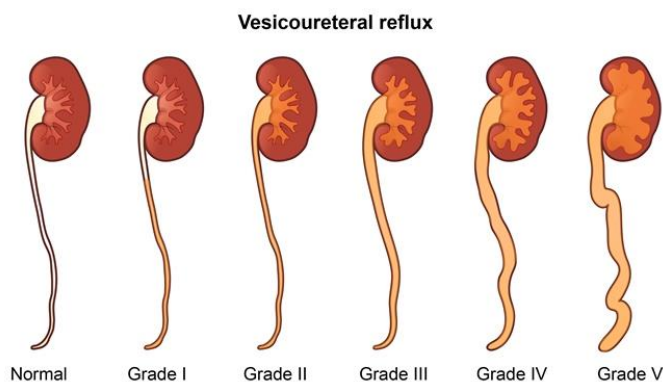
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Kidney stones

Nephrolithiasis				
Content	Frequency	Radiograph opacity	pH	Microscopic appearance
Calcium oxalate	70%-80%	↑↑	--	 <ul style="list-style-type: none"> Octahedron (square with an "X" in the center)
Calcium phosphate			>7.0	<ul style="list-style-type: none"> Elongated, wedge-shaped Forms rosettes
Magnesium ammonium phosphate (struvite or triple phosphate)	15%	↑	>7.0	 <ul style="list-style-type: none"> Rectangular prism ("coffin lids")
Uric acid	5%	--	<7.0	 <ul style="list-style-type: none"> Yellow or red-brown, diamond or rhombus
Cystine	1%	↑	<7.0	 <ul style="list-style-type: none"> Flat, yellow, hexagonal

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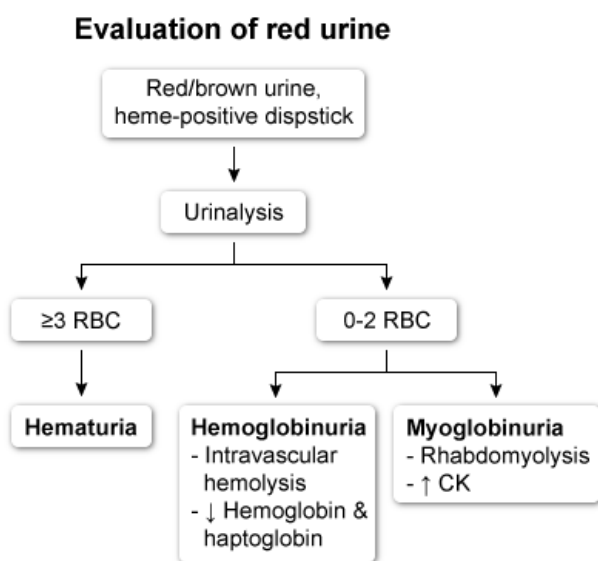
UTI due to vesicoureteral reflux



Grade	Description
I	Into a nondilated ureter
II	Into the pelvis & calyces without dilation
III	Mild to moderate dilation of the ureter, renal pelvis & calyces, with minimal blunting of the fornices
IV	Moderate ureteral tortuosity & dilation of the pelvis & calyces
V	Gross dilation of the ureter, pelvis & calyces; loss of papillary impressions; ureteral tortuosity

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Evaluation of red urine

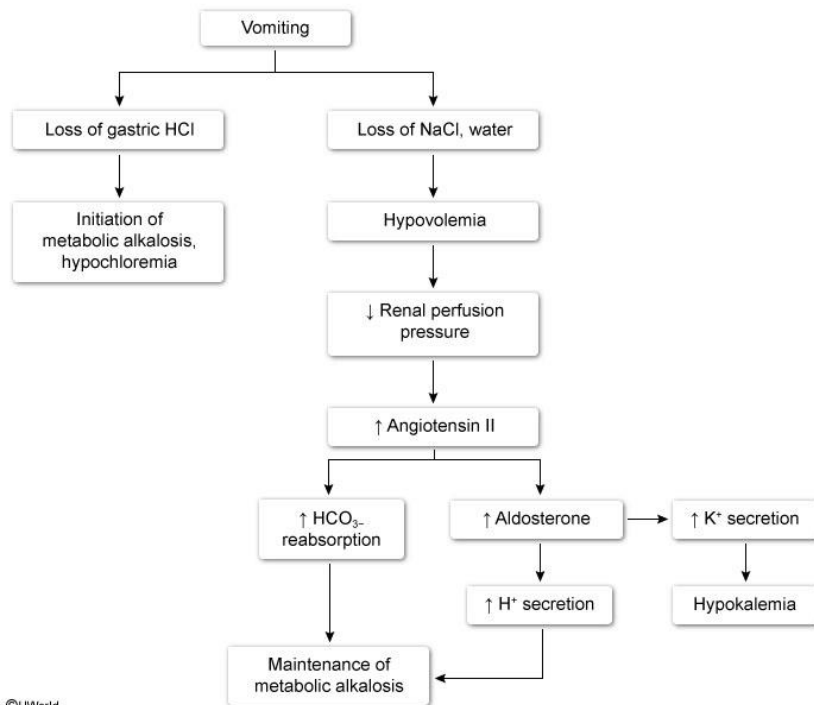


RBC = red blood cells; CK = creatine kinase

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Labs in persistent vomiting

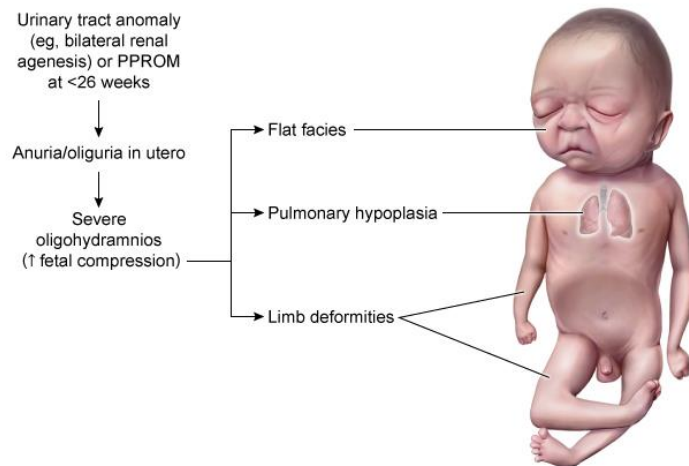
Laboratory abnormalities in persistent vomiting



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Potter sequence

Potter sequence

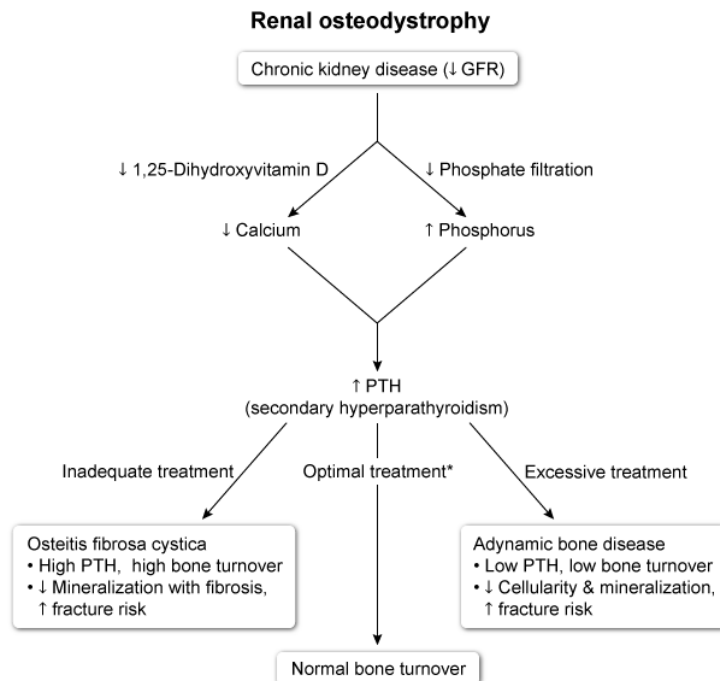


PPROM = preterm prelabor rupture of membranes.

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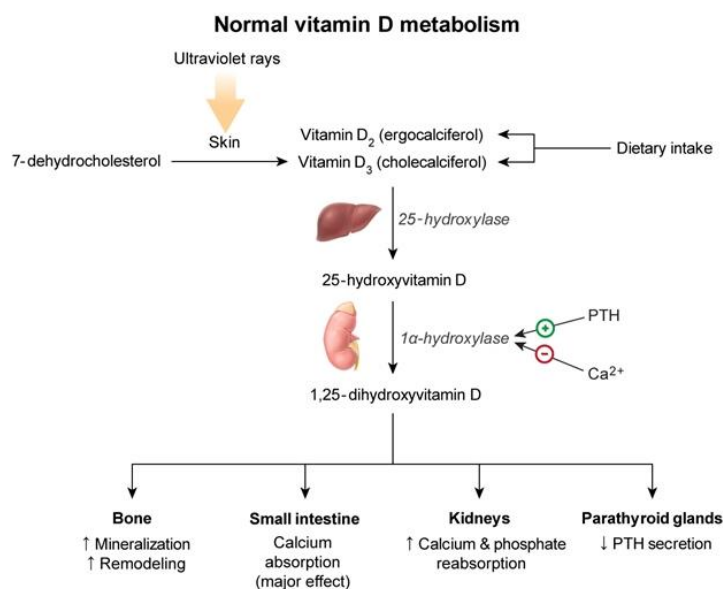
Surgery

Renal osteodystrophy



*Treatment involves dietary phosphate restriction ± phosphate binders. Once phosphorus is normalized, vitamin D can be given (while closely monitoring for hypercalcemia).
GFR = glomerular filtration rate; PTH = parathyroid hormone.

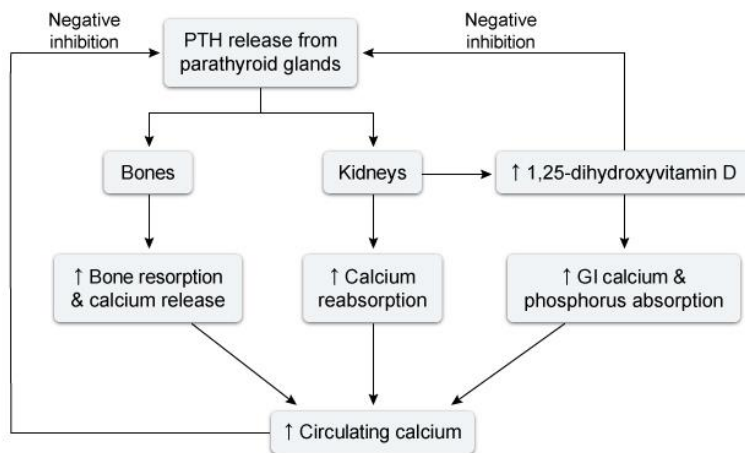
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PTH = parathyroid hormone.

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Parathyroid hormone, vitamin D & calcium axis

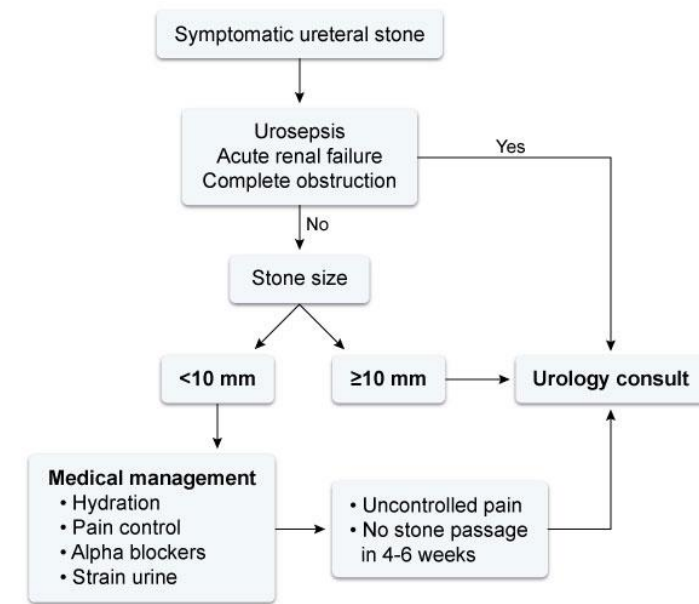


GI = gastrointestinal; PTH = parathyroid hormone.

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Management of ureteral stones

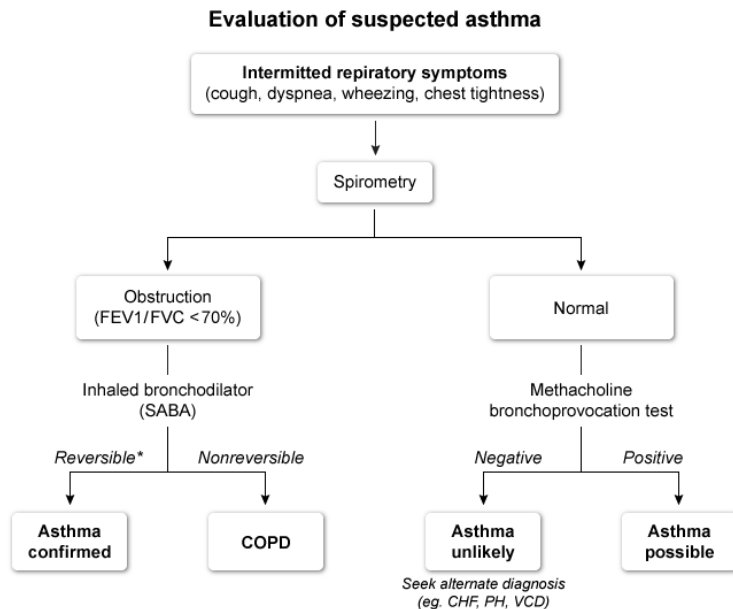
Management of ureteral stones



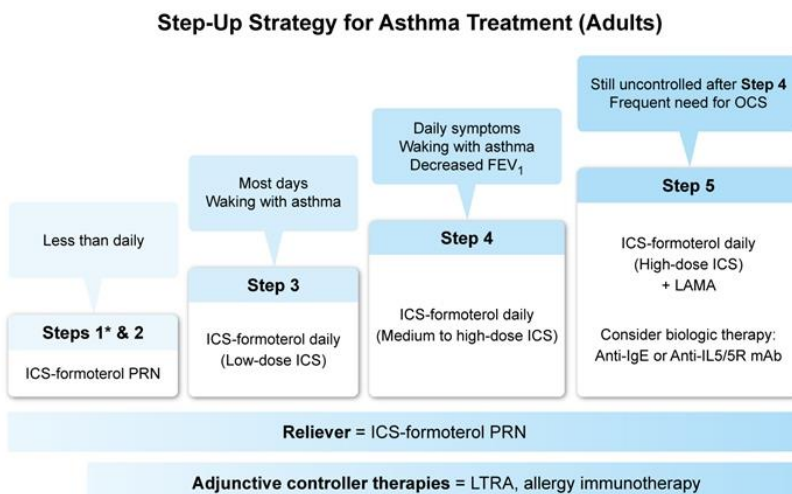
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3. Respiratory and critical care Medicine

Asthma evaluation



Treatment of asthma

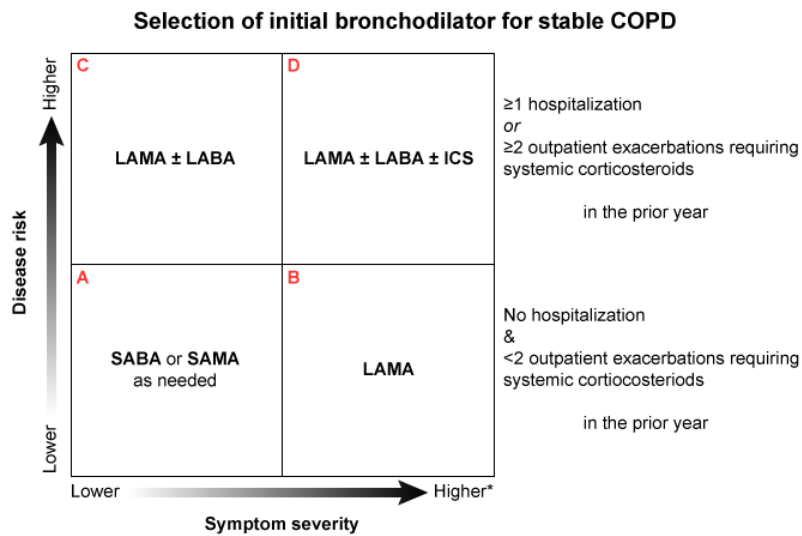


*Step 1: Alternatively, ICS + SABA may be used PRN

ICS = inhaled corticosteroid; LAMA = long-acting muscarinic antagonist; OCS = oral corticosteroid; mAb = monoclonal antibody; PRN = as needed; LTRA = leukotriene receptor antagonist; SABA = short-acting beta-2 agonist

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Treatment plan for COPD

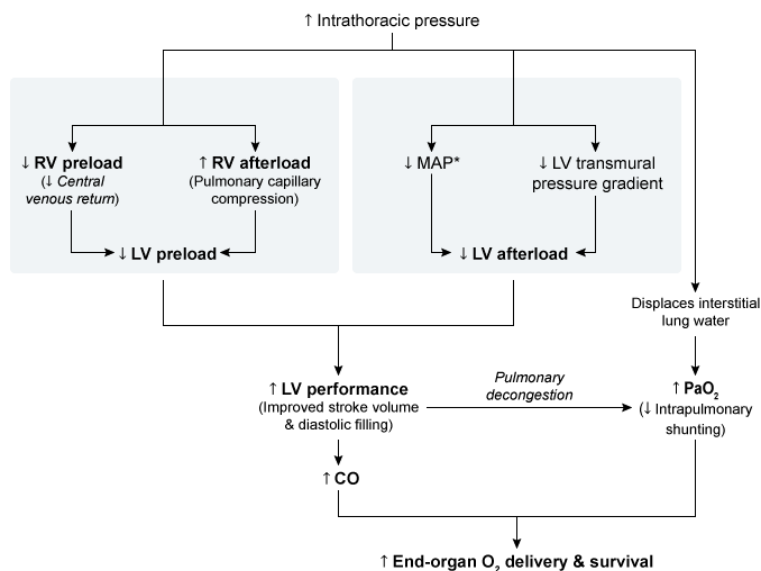


*Higher symptom severity = dyspnea with neutral exertion (light housework) or at rest.
Assessed using validated instruments such as COPD Assessment Test (CAT)

BA = beta-2 agonist; ICS = inhaled corticosteroids; LA = long-acting; MA = muscarinic antagonist;
SA = short-acting

Effects of Positive pressure ventilation in cardiogenic edema

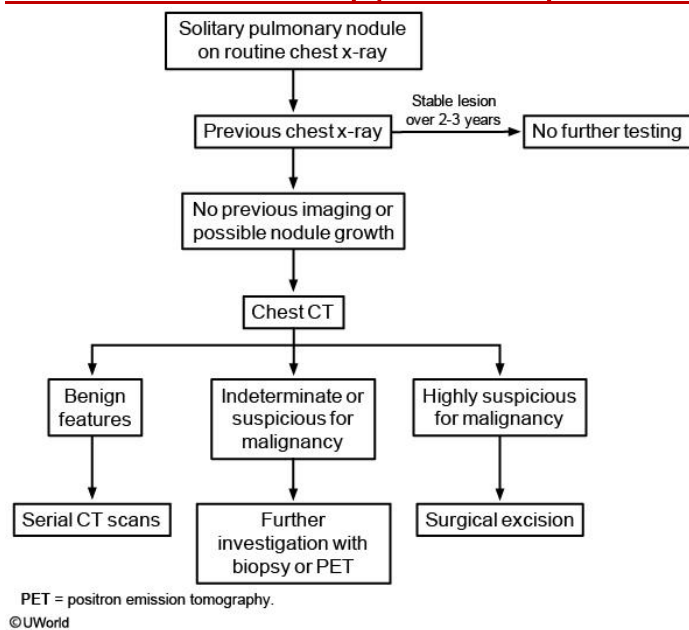
Effects of positive pressure ventilation in cardiogenic pulmonary edema



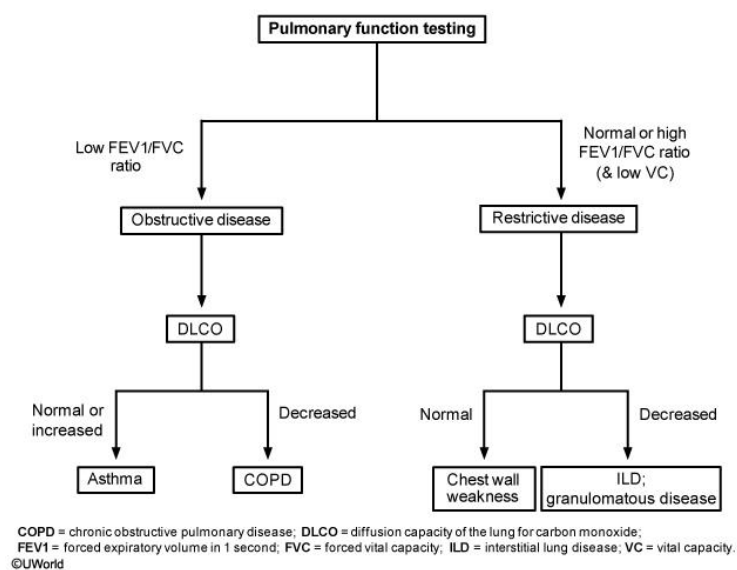
*Aortic compression triggers baroreceptor reflex to lower blood pressure.
CO = cardiac output; LV = left ventricle; MAP = mean arterial pressure; PaO₂ = arterial partial pressure of oxygen;
PVR = pulmonary vascular resistance; RV = right ventricle.

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Evaluation of solitary pulmonary nodule

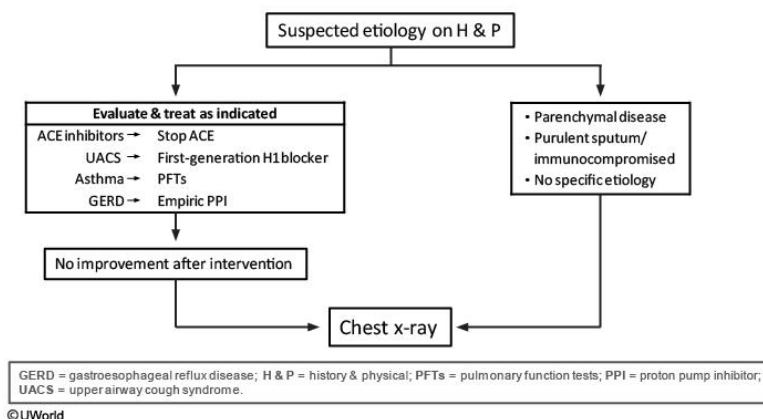


Pulmonary function testing



Evaluation of chronic cough

Evaluation of subacute (3-8 weeks) or chronic (>8 weeks) cough



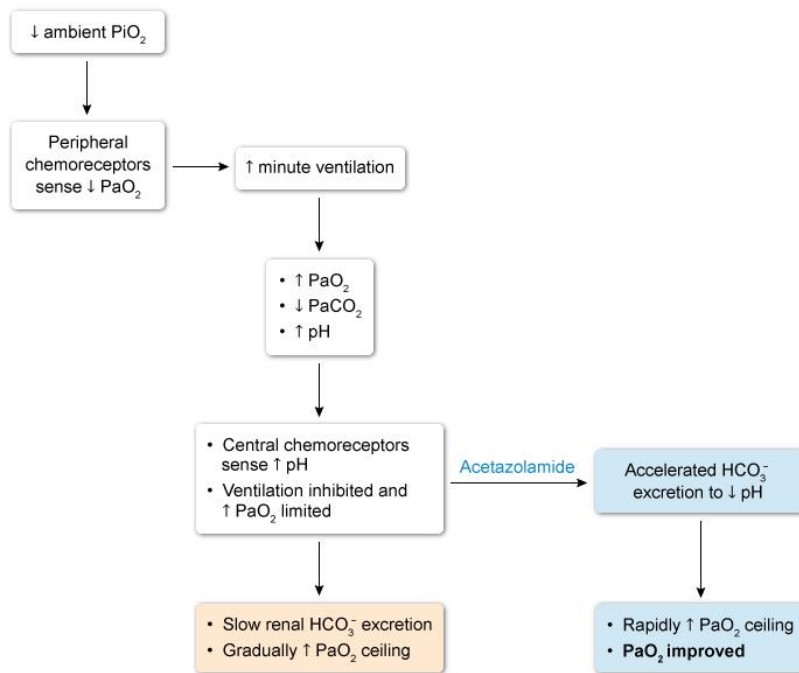
Differentials of hyponatremia

Hyponatremia			
Serum osmolality	ECV	Urine findings	Cause
Low (<275 mOsm/kg)	Hypovolemic	$U_{Na} < 40$ mEq/L	• Nonrenal salt loss (eg, vomiting, diarrhea, dehydration)
		$U_{Na} > 40$ mEq/L	• Renal salt loss (eg, diuretics, primary adrenal insufficiency)
	Euvolemic	$U_{Osm} < 100$ mOsm/kg	• Psychogenic polydipsia • Beer potomania
		$U_{Osm} > 100$ mOsm/kg & $U_{Na} > 40$ mEq/L	• SIADH (rule out hypothyroidism, secondary adrenal insufficiency)
	Hypervolemic	Variable	• CHF, hepatic failure, nephrotic syndrome
Normal	Variable		• Pseudohyponatremia (eg, paraproteinemia, hyperlipidemia)
High (>295 mOsm/kg)			• Hyperglycemia • Exogenous solutes (eg, mannitol)

CHF = congestive heart failure; ECV = extracellular volume; SIADH = syndrome of inappropriate antidiuretic hormone; U_{Na} = urine sodium; U_{Osm} = urine osmolality.

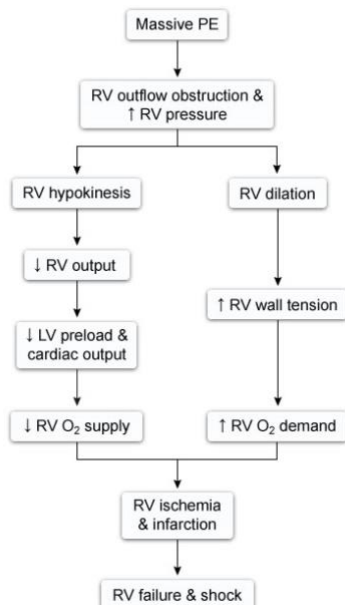
Acetazolamide for High altitude sickness

Mechanism of acetazolamide for prevention and treatment of high-altitude illness



Pulmonary embolism

Pathophysiology of massive pulmonary embolism

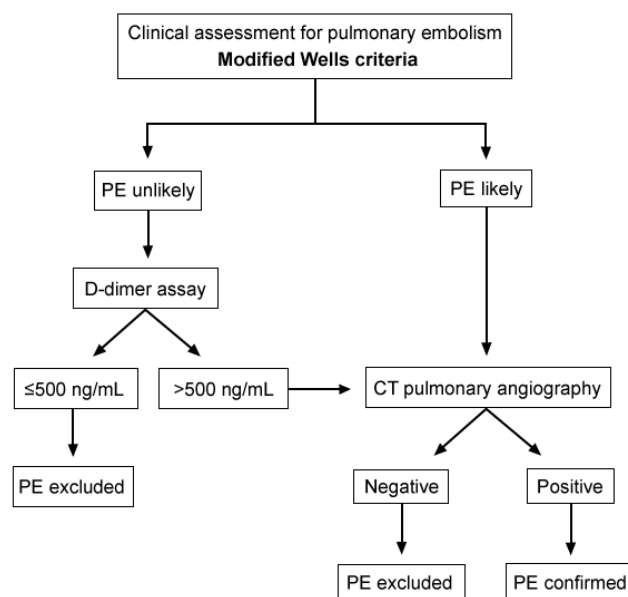


LV = left ventricular; PE = pulmonary embolism; RV = right ventricular.

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Diagnostic strategy in suspected pulmonary embolism

Diagnostic strategy in suspected pulmonary embolism

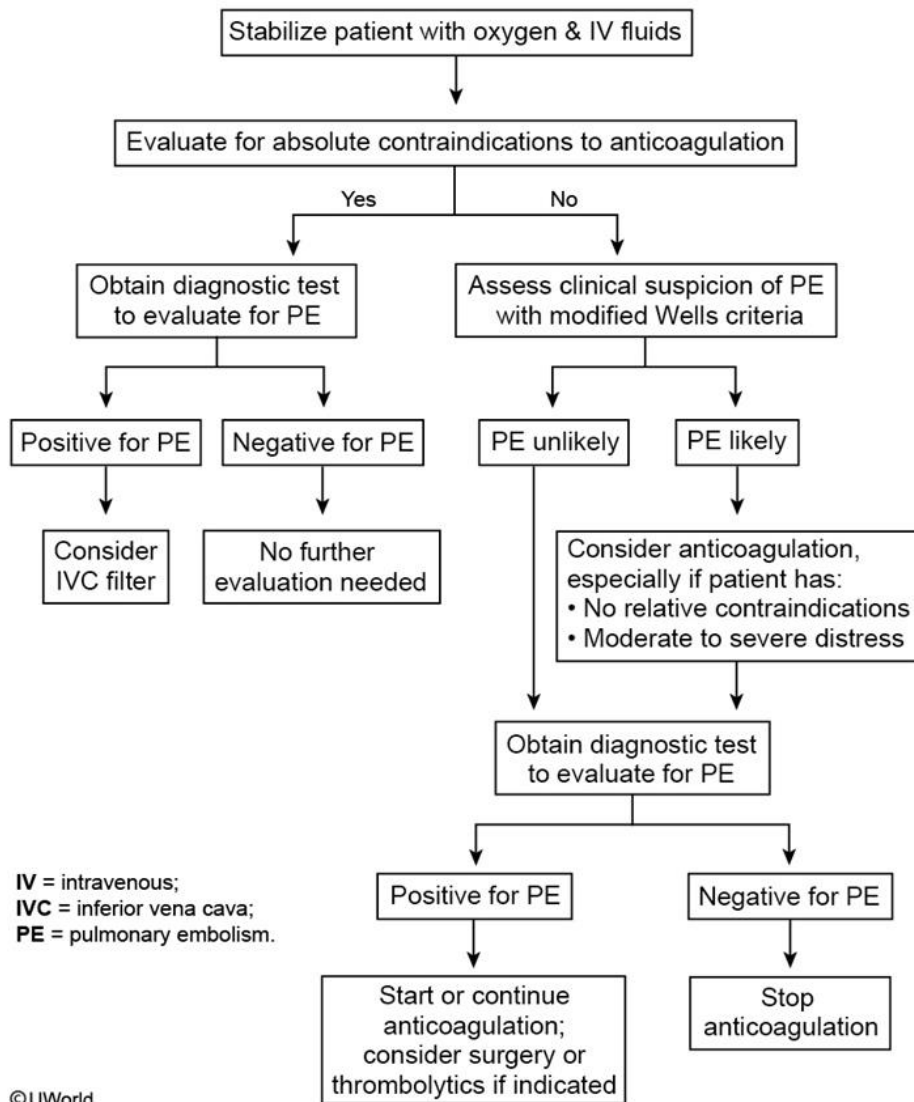


PE = pulmonary embolism.
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Modified Wells criteria for pretest probability of pulmonary embolism	
+3 points	<ul style="list-style-type: none"> Clinical signs of DVT Alternate diagnosis less likely than PE
+1.5 points	<ul style="list-style-type: none"> Previous PE or DVT Heart rate >100 Recent surgery or immobilization
+1 point	<ul style="list-style-type: none"> Hemoptysis Cancer
Total score	≤4 = PE unlikely >4 = PE likely
DVT = deep venous thrombosis; PE = pulmonary embolism.	

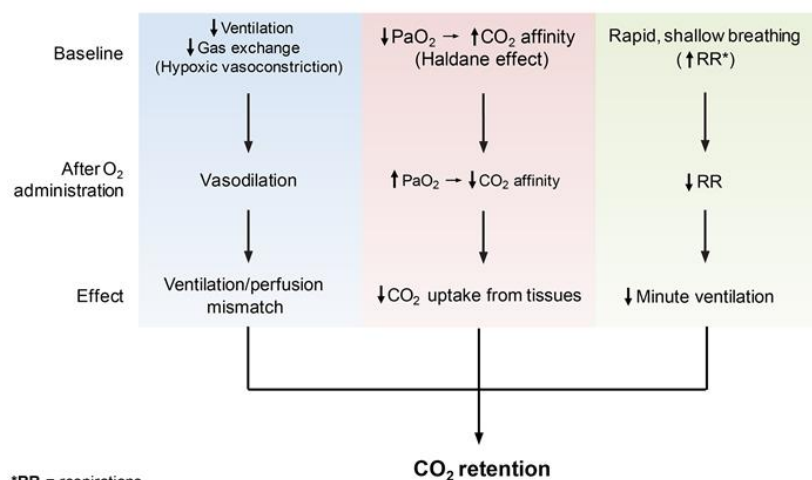
Suspected pulmonary embolism

Approach to patient with suspected pulmonary embolism

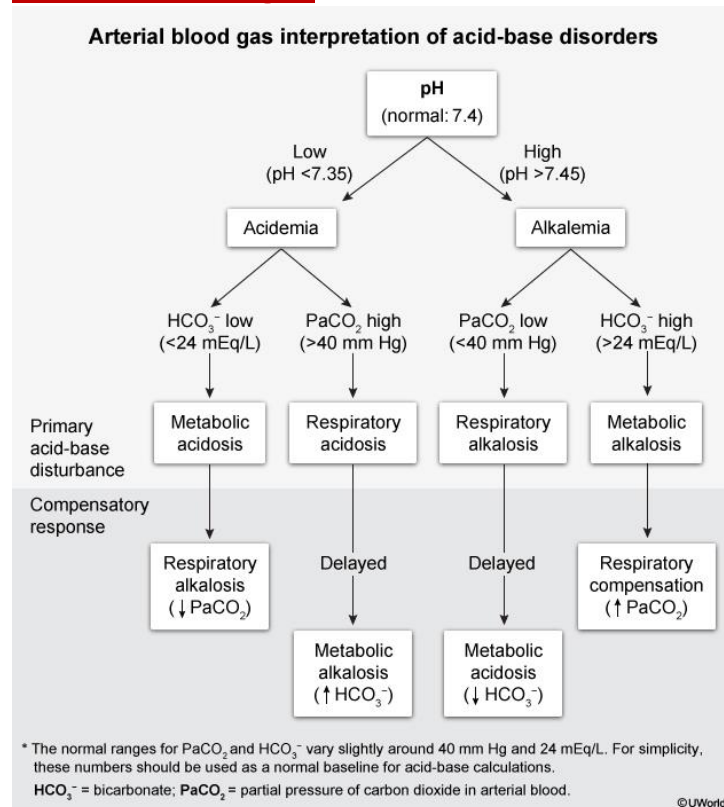


O₂ induced co₂ retention in COPD

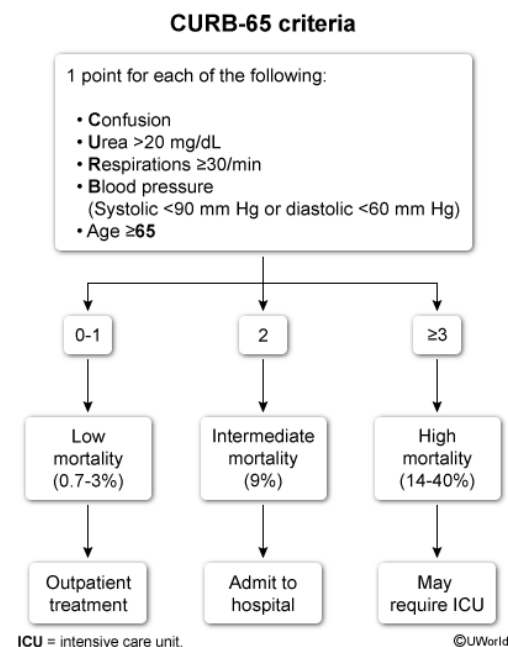
Oxygen-induced CO₂ retention in COPD



Arterial blood gas



CURB-65 criteria for CAP management

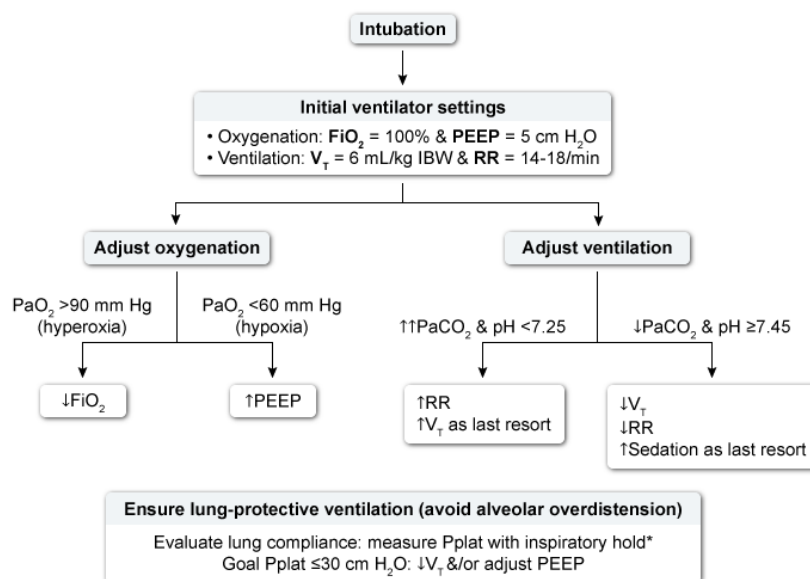


Community-acquired pneumonia	
Setting	Recommended therapy

Outpatient	<ul style="list-style-type: none"> • Healthy patients <ul style="list-style-type: none"> ○ Amoxicillin or doxycycline • Comorbid conditions (eg, diabetes, malignancy) <ul style="list-style-type: none"> ○ Fluoroquinolone or beta-lactam + macrolide
Inpatient (non-ICU)	<ul style="list-style-type: none"> • Fluoroquinolone <p>OR</p> <ul style="list-style-type: none"> • Beta-lactam + macrolide
Inpatient (ICU)	<ul style="list-style-type: none"> • Beta-lactam + macrolide <p>OR. Beta-lactam + fluoroquinolone</p>

ARDS : initial ventilator settings

Acute respiratory distress syndrome: Initial ventilator management



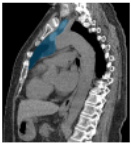

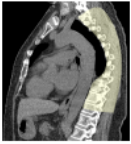
*Pause ventilator briefly after tidal volume is delivered and measure pressure required to hold the lungs at distension on current settings.

ABG = arterial blood gas; **ET** = endotracheal; **FiO₂** = fraction of inspired oxygen; **IBW** = ideal body weight; **Pplat** = plateau pressure; **PEEP** = positive end-expiratory pressure; **RR** = respiratory rate; **V_T** = tidal volume

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Pediatrics

Mediastinal masses

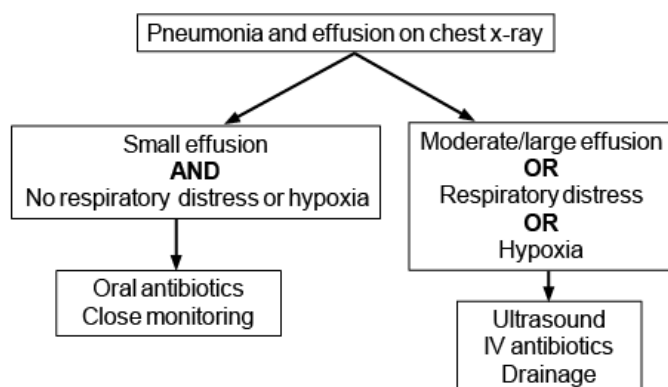
Mediastinal Compartments, Structures, & Masses		
Compartment	Structures	Masses
Anterior 	<ul style="list-style-type: none"> Thymus Lymph nodes* 	<ul style="list-style-type: none"> Thymic neoplasms (eg, thymoma) Lymphoma Germ cell tumors <ul style="list-style-type: none"> Teratomas Seminomas, nonseminomas Thyroid tissue (eg, ectopic, substernal goiter)
Middle** 	<ul style="list-style-type: none"> Lymph nodes* Pericardium Heart & great vessels Trachea & main bronchi Esophagus 	<ul style="list-style-type: none"> Lymphadenopathy (eg, sarcoidosis, lung cancer), lymphoma Benign cystic masses (eg, pericardial cyst, bronchogenic cyst) Vascular masses Esophageal tumors
Posterior** 	<ul style="list-style-type: none"> Neural tissue Vertebrae Lymph nodes* 	<ul style="list-style-type: none"> Neurogenic tumors (eg, schwannoma, neurofibroma), meningocele Spinal masses (eg, metastases) Lymphoma

*Lymph nodes, from which lymphoma may arise, are present in all 3 compartments.
**Some sources define the middle & posterior compartments based on their relationship to the posterior pericardial surface rather than the posterior thoracic wall.

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Management of parapneumonic effusion

Management of Parapneumonic Effusions



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Parapneumonic effusions

Parapneumonic effusions		
	Uncomplicated	Complicated
Etiology	Sterile exudate in pleural space	Bacterial invasion of pleural space
Radiologic appearance	Small to moderate & free flowing	Moderate to large, free flowing or loculated

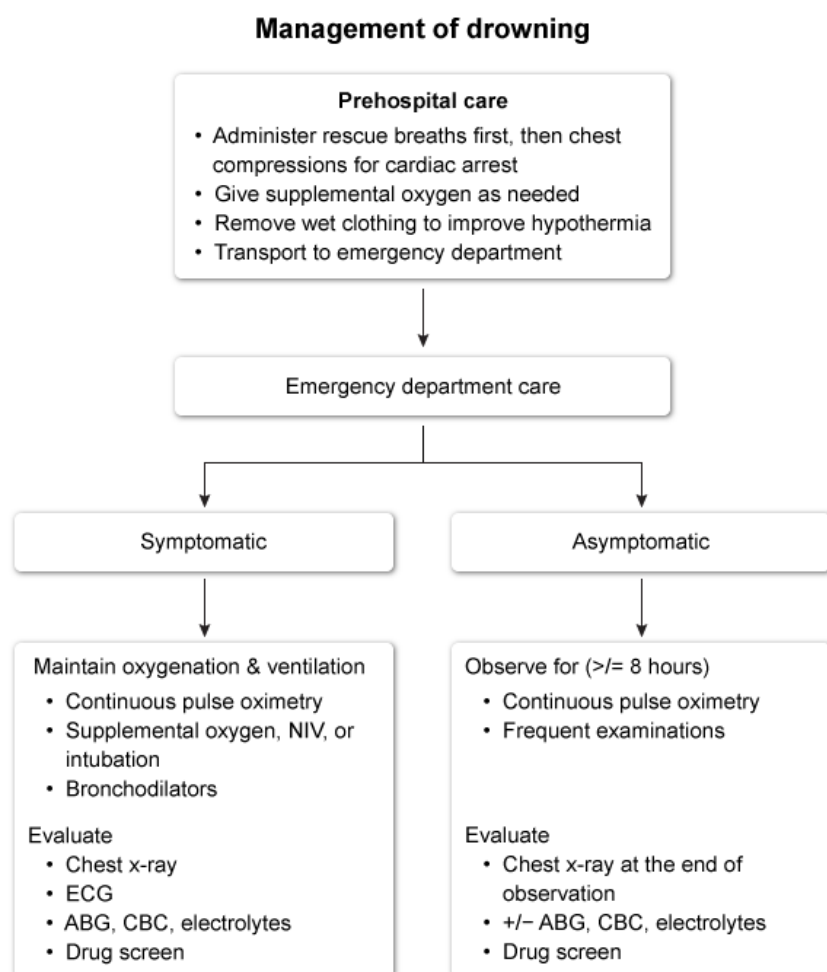
Pleural fluid characteristics	<ul style="list-style-type: none"> pH ≥ 7.2 Glucose ≥ 60 mg/dL WBCs $\leq 50,000/\text{mm}^3$ LDH $\leq 1,000$ units/L 	<ul style="list-style-type: none"> pH < 7.2 Glucose < 60 mg/dL WBCs $> 50,000/\text{mm}^3$ LDH $> 1,000$ units/L
Pleural fluid Gram stain & culture	Negative	Positive or negative*
Treatment	Antibiotics	Antibiotics & drainage

***Gram stain & culture are often falsely negative due to low bacterial count. Both are typically positive in empyema, which represents advanced progression of a complicated effusion.**

LDH = lactate dehydrogenase; WBC = white blood cell.

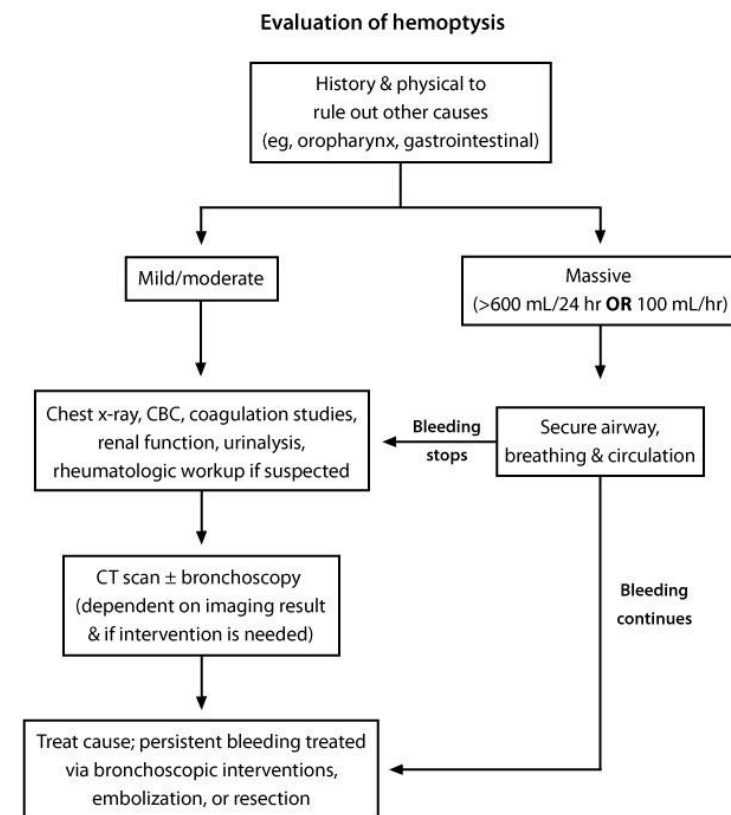
Surgery

Management of drowning



ABG = arterial blood gas analysis; CBC = complete blood count; NIV = noninvasive ventilation ©UWorld

Management of hemoptysis

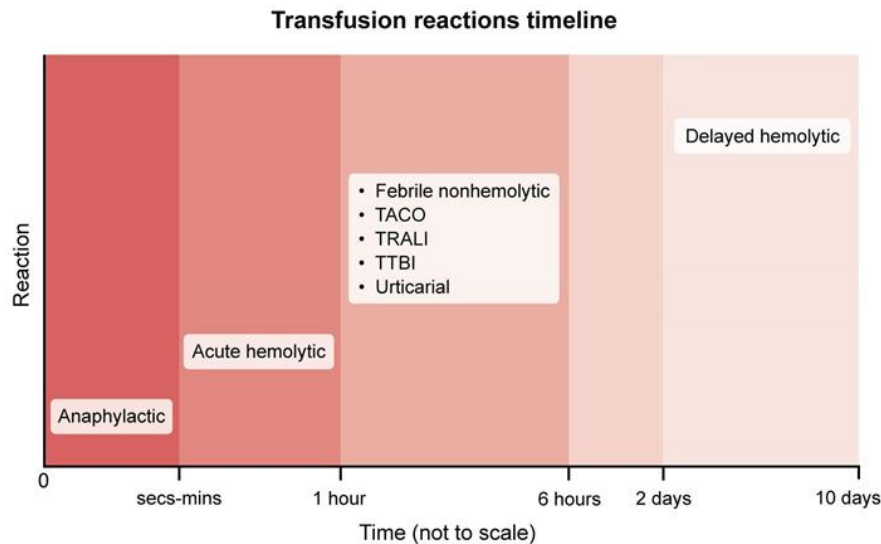


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4. Hematology and oncology

Medicine

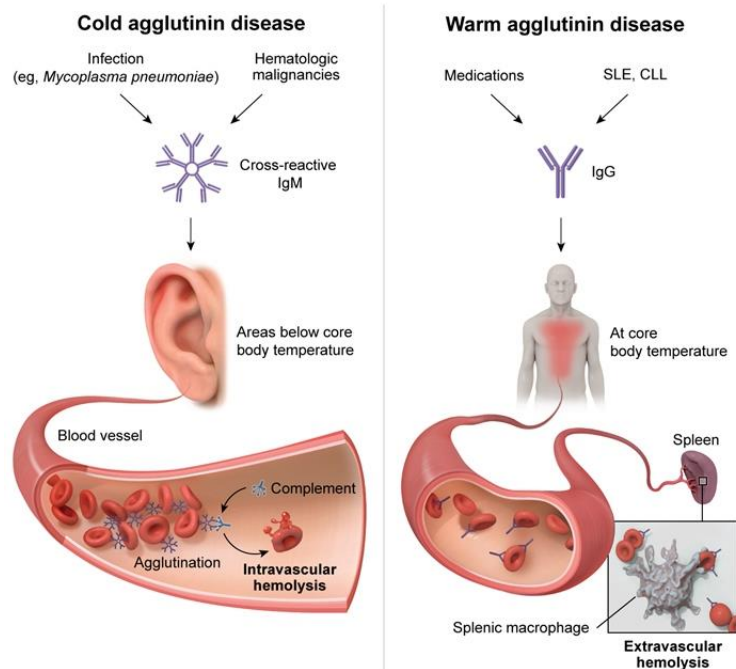
Transfusion reactions timeline



TACO = transfusion-associated circulatory overload;
TRALI = transfusion-related acute lung injury; TTBI = transfusion-transmitted bacterial infection.

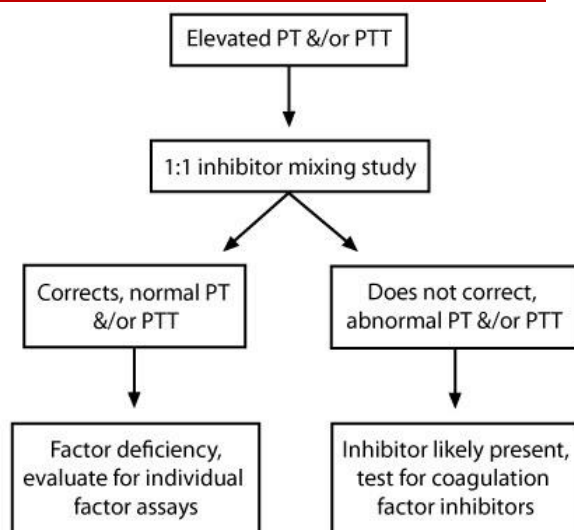
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Cold vs warm agglutinins



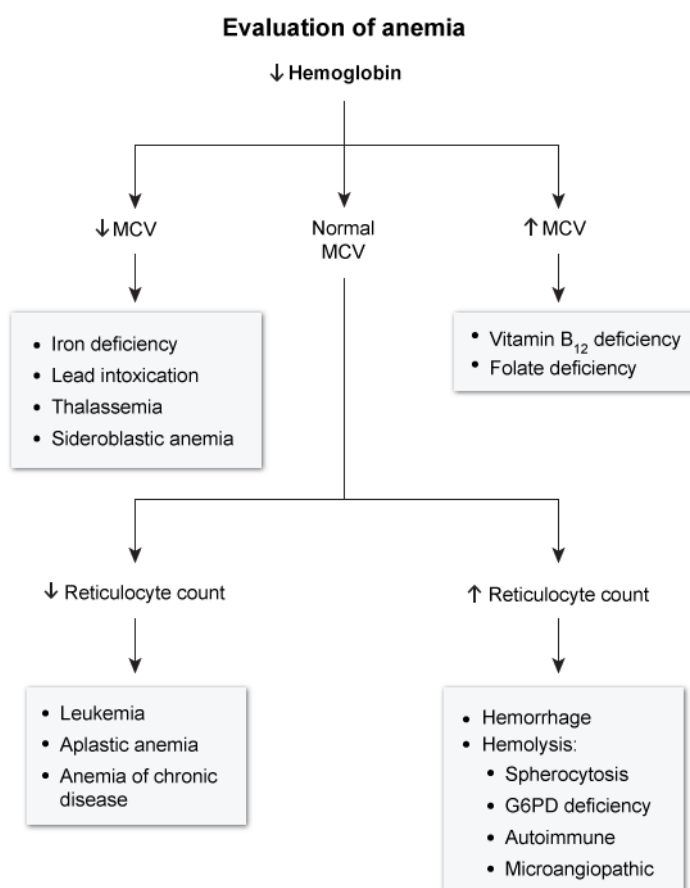
CLL = chronic lymphocytic leukemia; SLE = systemic lupus erythematosus.
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Evaluation of elevated PT & PTT



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Evaluation of anemia



MCV = Mean corpuscular volume; G6PD = Glucose-6-phosphate-dehydrogenase deficiency.

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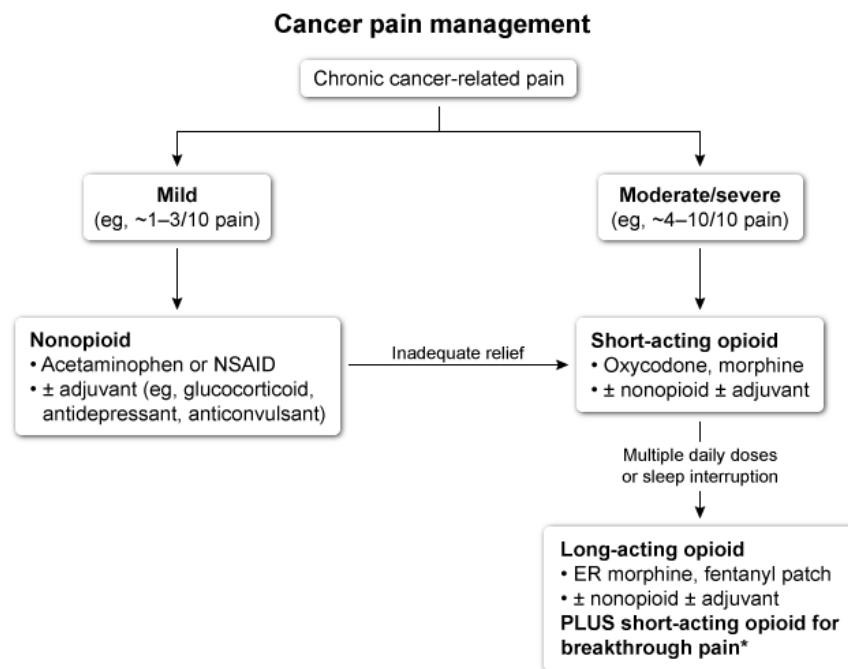
Transfusion reactions

Transfusion reactions associated with hypotension			
Reaction	Onset*	Cause	Clinical features
Anaphylaxis	Seconds to minutes	Recipient anti-IgA antibodies	<ul style="list-style-type: none"> Shock, angioedema/urticaria & respiratory distress
Transfusion-related acute lung injury	Minutes to hours	Donor antileukocyte antibodies	<ul style="list-style-type: none"> Respiratory distress & noncardiogenic pulmonary edema Bilateral pulmonary infiltrates
Acute hemolysis	Minutes to hours	ABO incompatibility	<ul style="list-style-type: none"> Fever, flank pain, hemoglobinuria & DIC
Bacterial sepsis	Minutes to hours	Bacterial contamination of donor product	<ul style="list-style-type: none"> Fever, chills, septic shock & DIC
*Time after transfusion initiation.			
DIC = disseminated intravascular coagulation.			

Iron studies in anemia

Iron studies in microcytic anemia					
Cause	MCV	Iron	TIBC	Ferritin	Transferrin saturation (Iron/TIBC)
Iron deficiency	↓	↓	↑	↓	↓
Thalassemia	↓↓	↑	↓	↑	↑↑
Anemia of chronic disease (inflammation)	Normal/↓	↓	↓	Normal/↑	Normal/↓
MCV = mean corpuscular volume; TIBC = total iron binding capacity.					

Cancer pain management

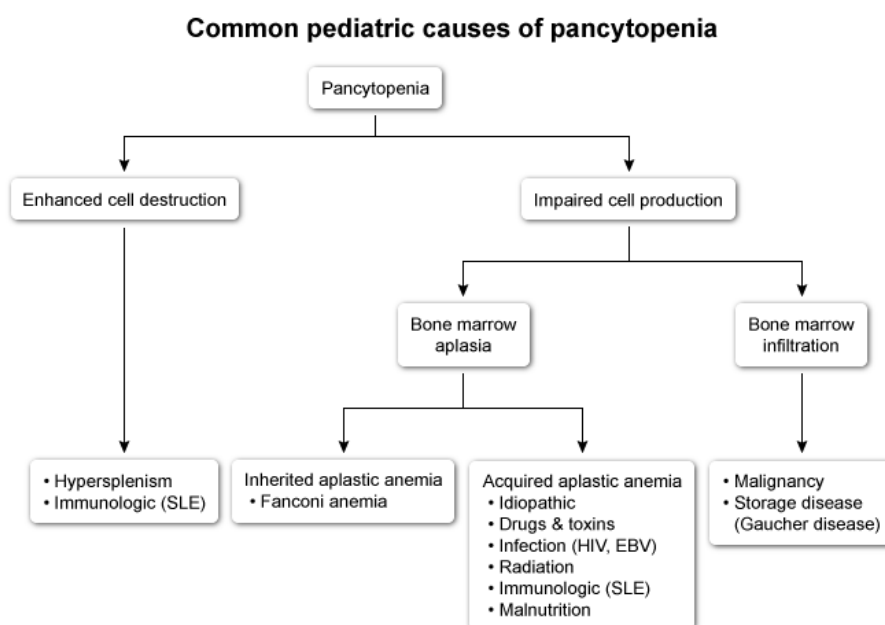


*Short-acting opioids for breakthrough pain should always be available.
ER = extended-release; NSAID = nonsteroidal anti-inflammatory drug.

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Pediatrics

Common pediatric causes of pancytopenia



EBV = Epstein Barr-virus, SLE = systemic lupus erythematosus.

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Electrophoresis in SCD

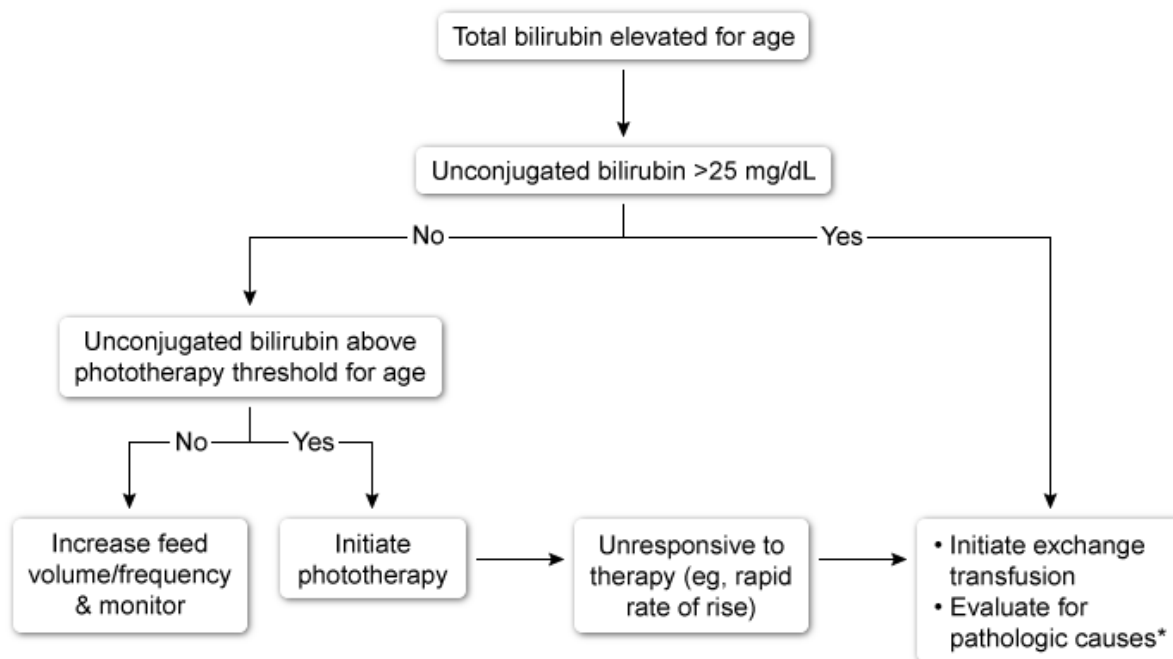
Electrophoresis patterns in sickle cell syndromes					
	HbA	HbA2	HbF	HbS	HbC
Normal	++++	+	+	None	None
Sickle cell trait	+++	+	+	+++	None
Sickle cell anemia (SCA)	None	+	+	++++	None
SCA on hydroxyurea	None	+	++	+++	None
Hemoglobin SC disease	None	+	+	+++	+++

Thalassemia

Alpha thalassemia		
Genotype	Disorder	Clinical features
1 gene loss ($\alpha\alpha/\alpha-$)	Alpha thalassemia minima	Asymptomatic, silent carrier
2 gene loss ($\alpha\alpha/---$) or ($\alpha-/ \alpha-$)	Alpha thalassemia minor	Mild microcytic anemia
3 gene loss ($\alpha-/---$)	Hemoglobin H disease	Chronic hemolytic anemia
4 gene loss ($---/---$)	Hydrops fetalis, hemoglobin Barts	High-output cardiac failure, anasarca, death in utero

Neonatal jaundice

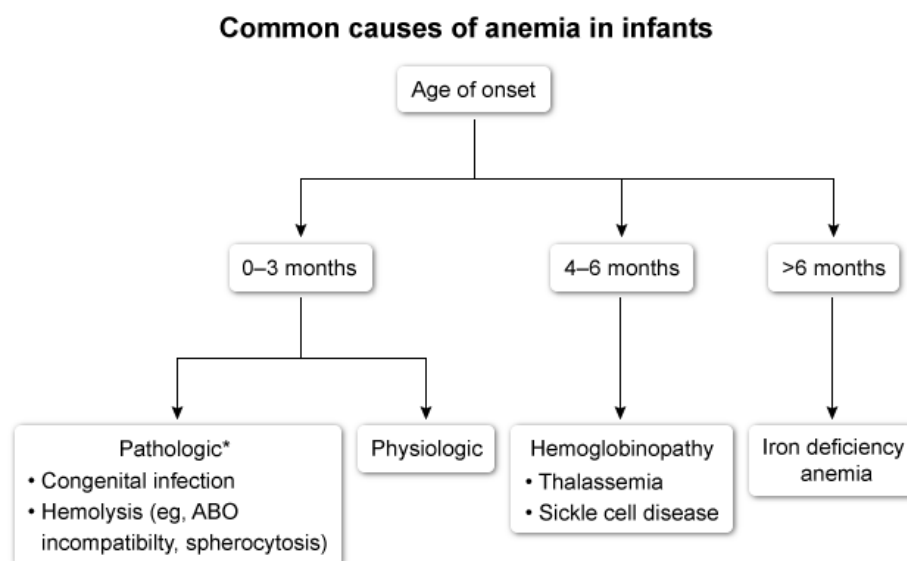
Management of neonatal unconjugated hyperbilirubinemia



*eg, RhD incompatibility, glucose-6-phosphatase deficiency.

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Common causes of anemia in infants



*Symptomatic, age <1 month, hemoglobin <9 g/dL, microcytosis

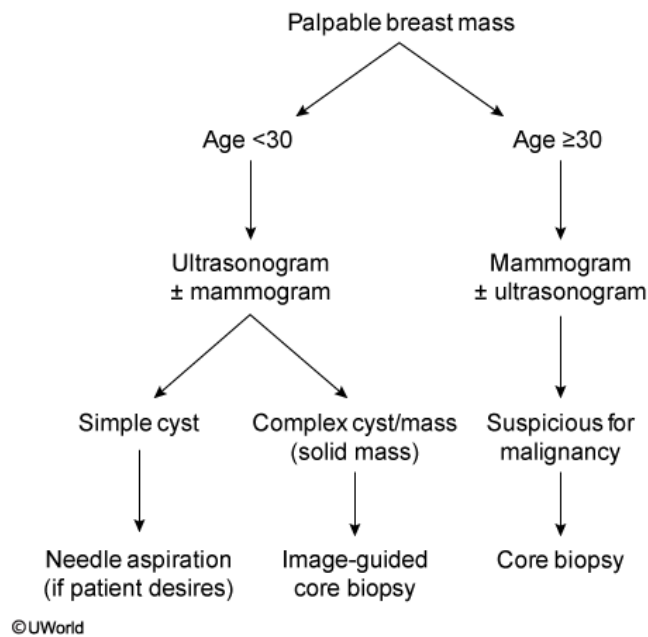
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Surgery

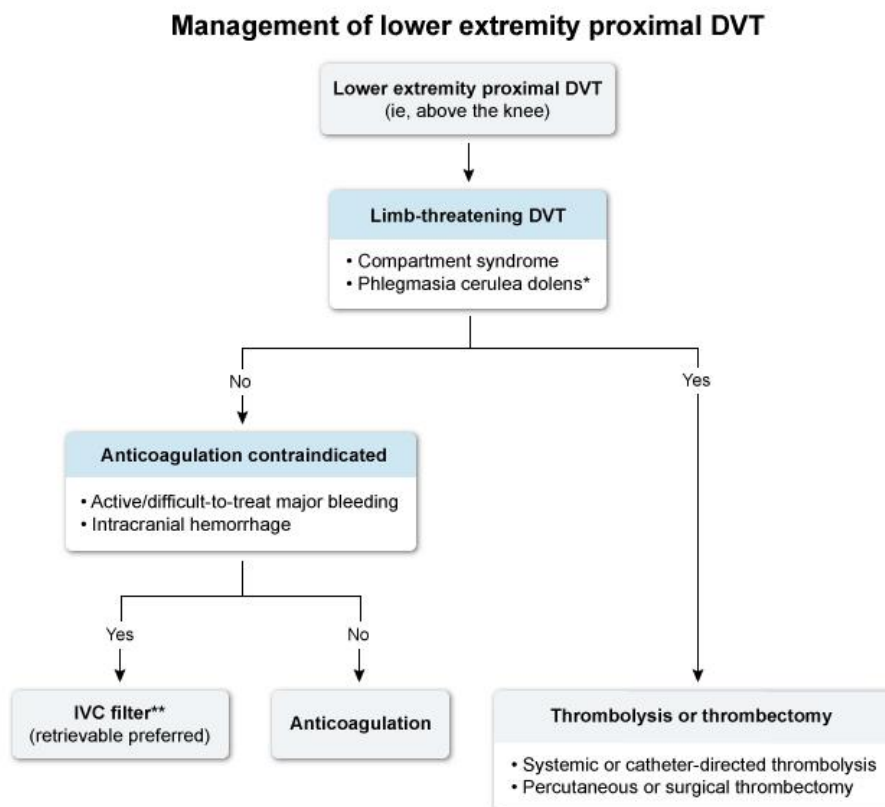
Transfusion reactions

Transfusion reactions associated with hypotension			
Reaction	Onset*	Cause	Clinical features
Anaphylaxis	Seconds to minutes	Recipient anti-IgA antibodies	<ul style="list-style-type: none"> Shock, angioedema/urticaria & respiratory distress
Transfusion-related acute lung injury	Minutes to hours	Donor antileukocyte antibodies	<ul style="list-style-type: none"> Respiratory distress & noncardiogenic pulmonary edema Bilateral pulmonary infiltrates
Acute hemolysis	Minutes to hours	ABO incompatibility	<ul style="list-style-type: none"> Fever, flank pain, hemoglobinuria & DIC
Bacterial sepsis	Minutes to hours	Bacterial contamination of donor product	<ul style="list-style-type: none"> Fever, chills, septic shock & DIC
*Time after transfusion initiation.			
DIC = disseminated intravascular coagulation.			

Palpable breast mass



Management of lower extremity proximal DVT



*Large occlusive iliofemoral DVT → venous limb ischemia & gangrene (cyanosis, bullae, massive edema, extreme pain).

**Lesser (relative) indications: clot propagation despite anticoagulation, ↓↓ cardiopulmonary reserve (eg, impending right ventricular failure).

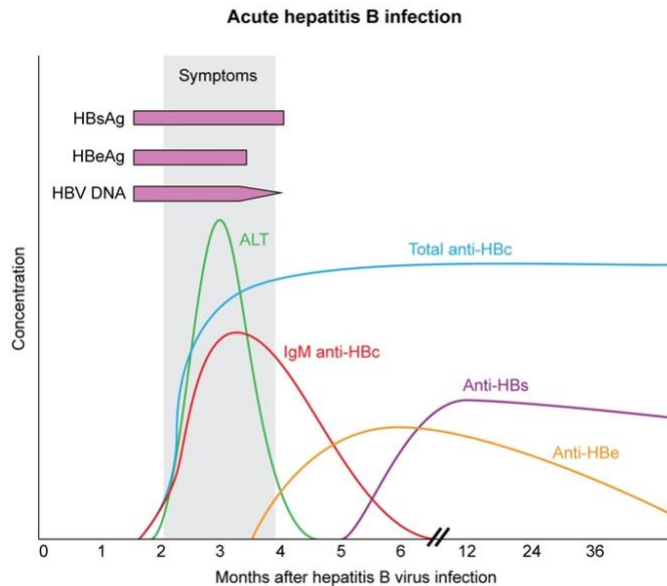
DVT = deep vein thrombosis; IVC = inferior vena cava.

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5. Gastrointestinal system

Medicine

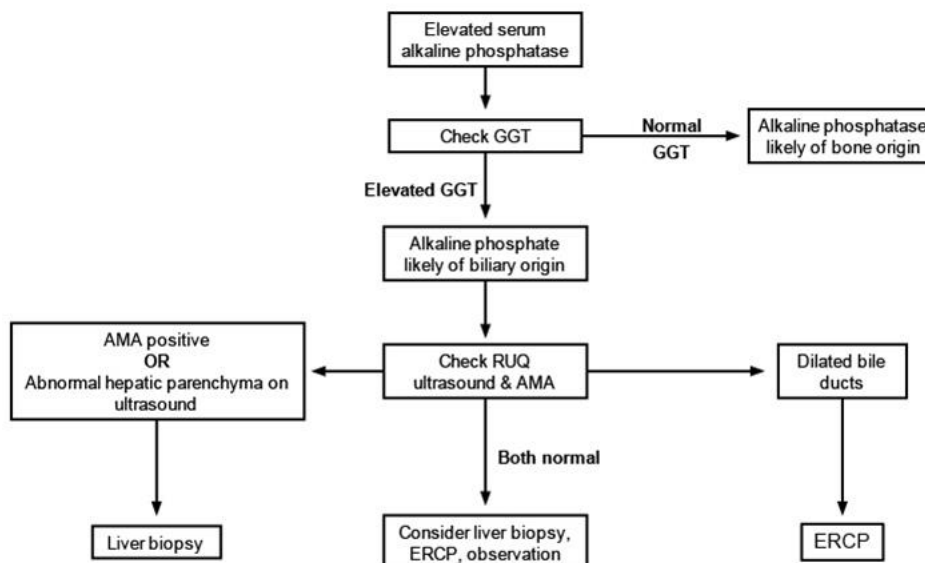
Hep B infection



ALT = alanine aminotransferase; anti-HBc = hepatitis B core antibody; anti-HBe = hepatitis B e antibody; anti-HBs = hepatitis B surface antibody; HBeAg = hepatitis B e antigen; HBsAg = hepatitis B surface antigen; HBV = hepatitis B virus.
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Evaluation of elevated alk phos

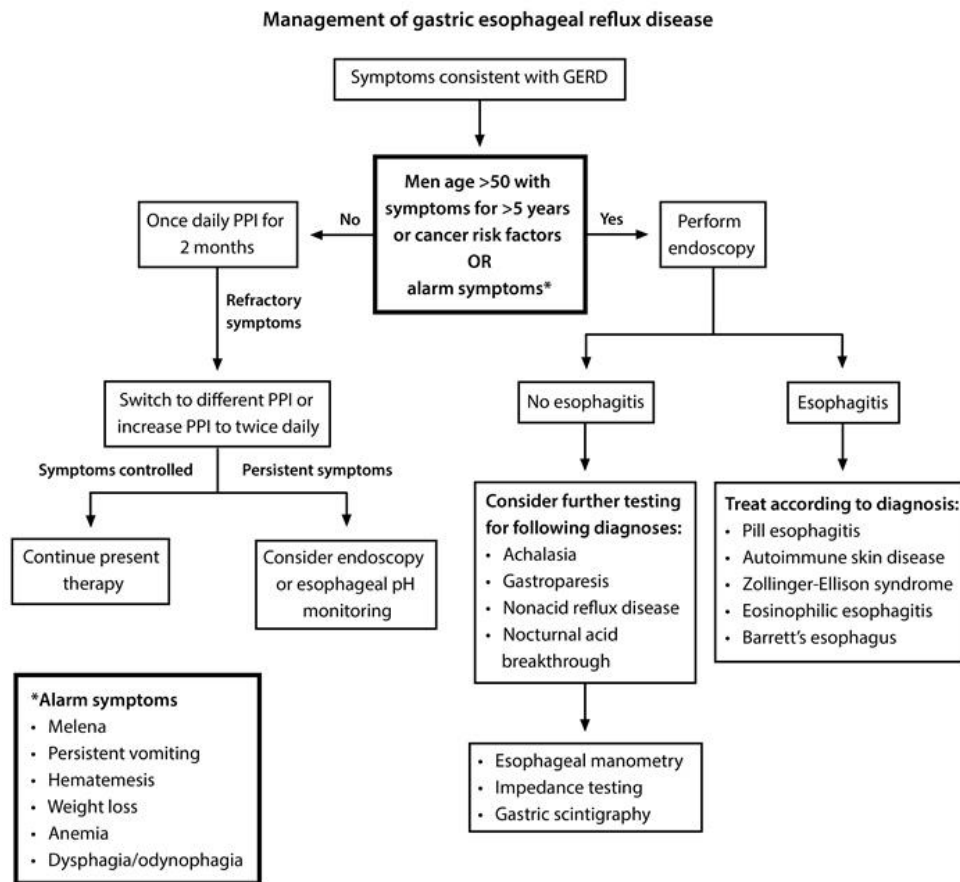
Evaluation of elevated alkaline phosphatase



AMA = antimitochondrial antibody; ERCP = endoscopic retrograde cholangiopancreatogram; GGT = gamma-glutamyltransferase; RUQ = right upper quadrant.

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GERD

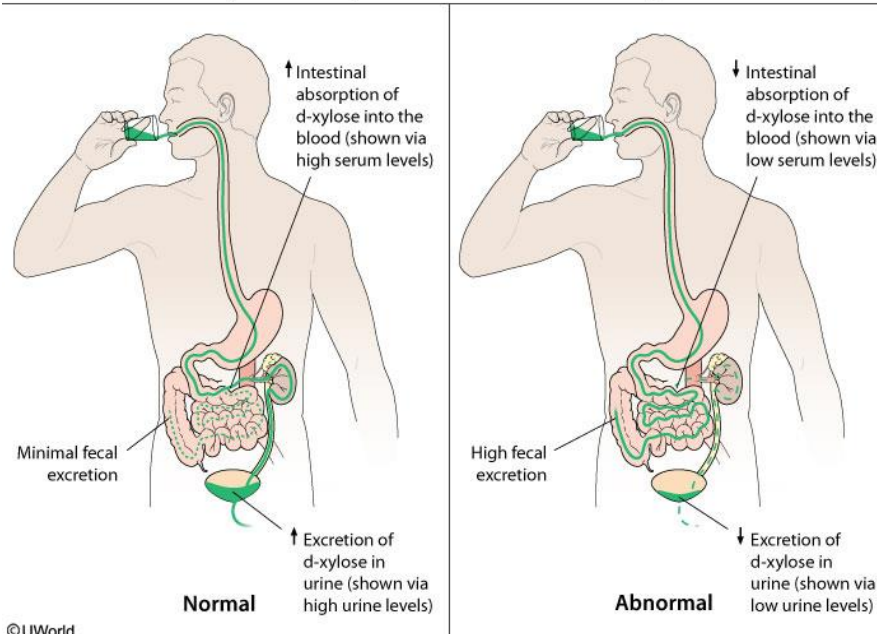


GERD = gastric esophageal reflux disease; PPI = proton pump inhibitor.

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d-xylose test

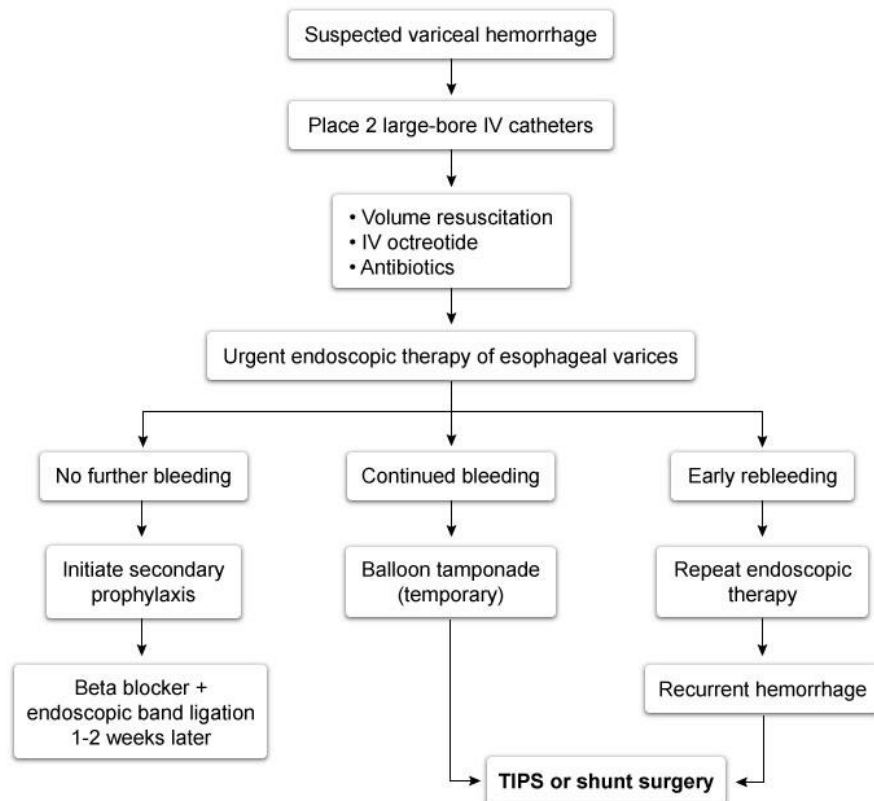
D-xylose test of proximal small intestinal absorption



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Management of variceal bleeding

Variceal hemorrhage bleed algorithm

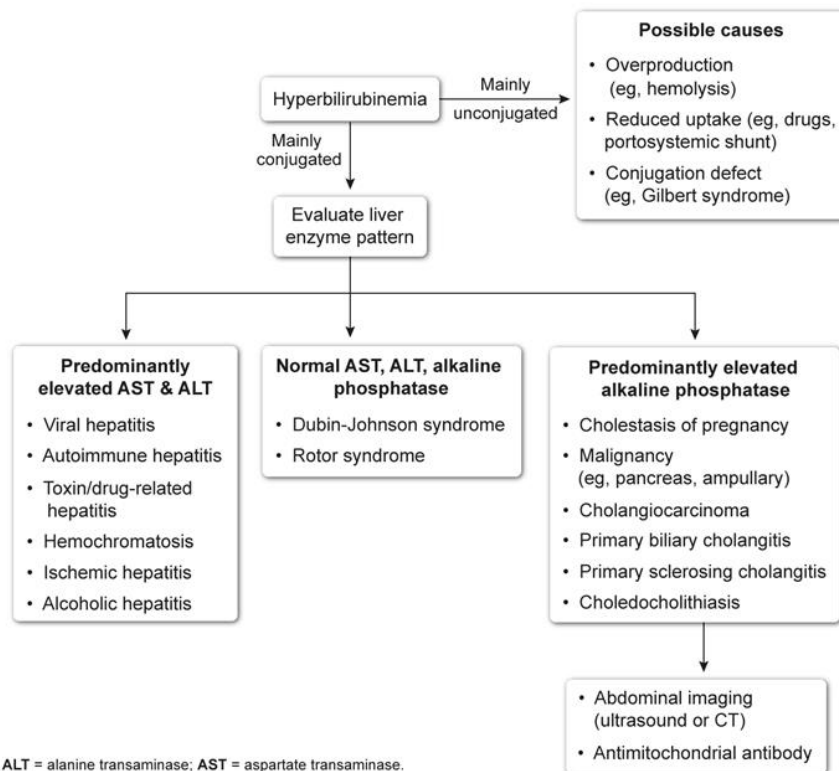


IV = intravenous; TIPS = transjugular intrahepatic portosystemic shunt.

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Hyperbilirubinemia in adults

Approach to hyperbilirubinemia in adults



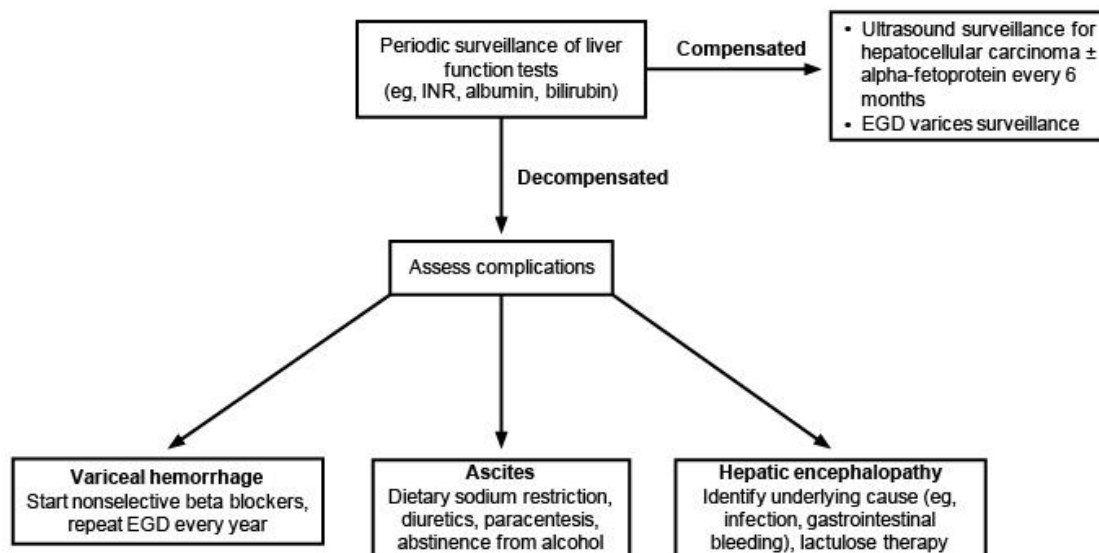
Colon cancer screening

Colon cancer screening	
Patients at average risk	<ul style="list-style-type: none"> • Start at age 45: <ul style="list-style-type: none"> ○ Colonoscopy every 10 years ○ gFOBT or FIT every year ○ FIT-DNA every 1-3 years ○ CT colonography every 5 years ○ Flexible sigmoidoscopy every 5 years (or every 10 years with annual FIT)
Patients with FDR with CRC or high-risk adenomatous polyp*	<ul style="list-style-type: none"> • Colonoscopy at age 40 (or 10 years prior to age of diagnosis in FDR, whichever comes first) • Repeat every 5 years (every 10 years if FDR diagnosed at age >60)
Patients with ulcerative colitis	<ul style="list-style-type: none"> • Start screening 8-10 years after diagnosis • Colonoscopy every 1-3 years
*Adenomatous polyp ≥10 mm, high-grade dysplasia, villous elements (for example).	

CRC = colorectal cancer; FDR = first-degree relative; FIT = fecal immunochemical test; FIT-DNA = multitarget stool DNA test; gFOBT = guaiac-based fecal occult blood test.

Management of ascites

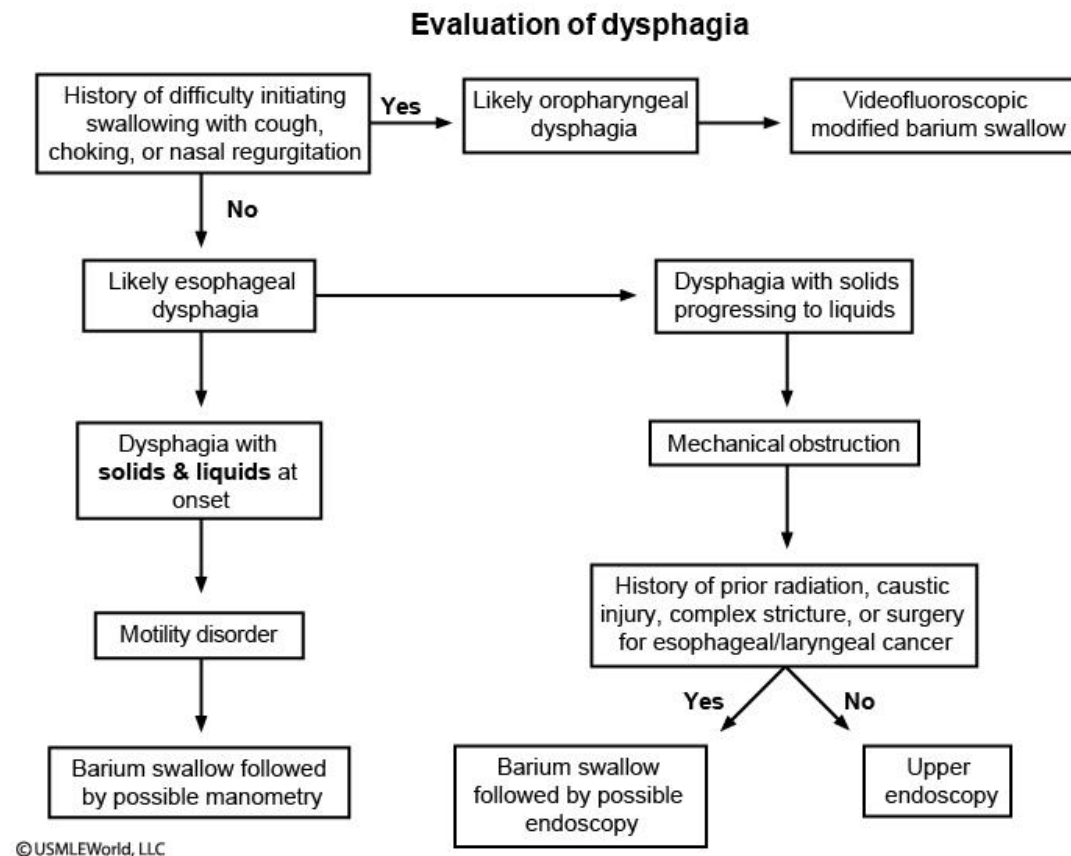
Management of cirrhosis



EGD = esophagogastroduodenoscopy.

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Evaluation of dysphagia



Pediatrics

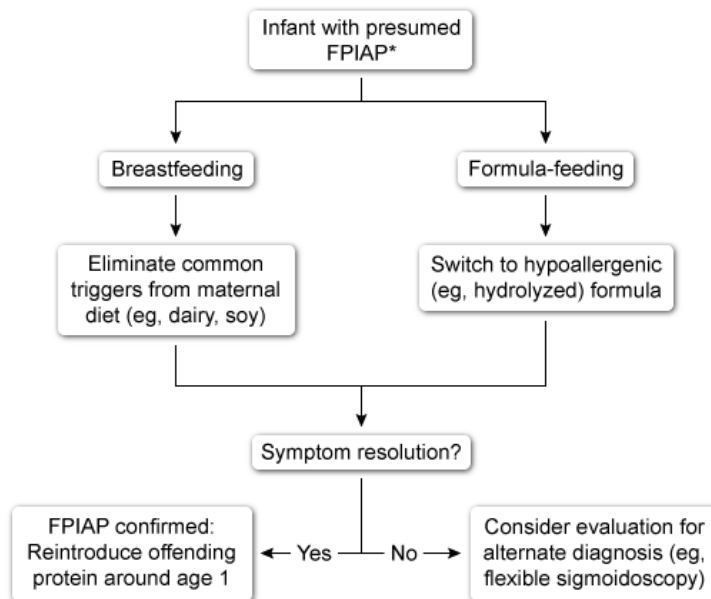
Lactation failure jaundice vs breast milk jaundice

Lactation failure jaundice vs breast milk jaundice			
Diagnosis	Timing	Pathophysiology	Clinical features
Lactation failure jaundice	Age <1 week	Insufficient intake of breast milk: <ul style="list-style-type: none"> ↓ Bilirubin elimination ↑ Enterohepatic circulation 	<ul style="list-style-type: none"> Suboptimal breastfeeding Signs of dehydration
Breast milk jaundice	Age >1 week (peaks at 2 weeks)	↑ β -glucuronidase in breast milk: <ul style="list-style-type: none"> ↑ Deconjugation of intestinal bilirubin 	<ul style="list-style-type: none"> Adequate breastfeeding Well-hydrated

- ↑ Enterohepatic circulation

Food protein induced allergic proctocolitis

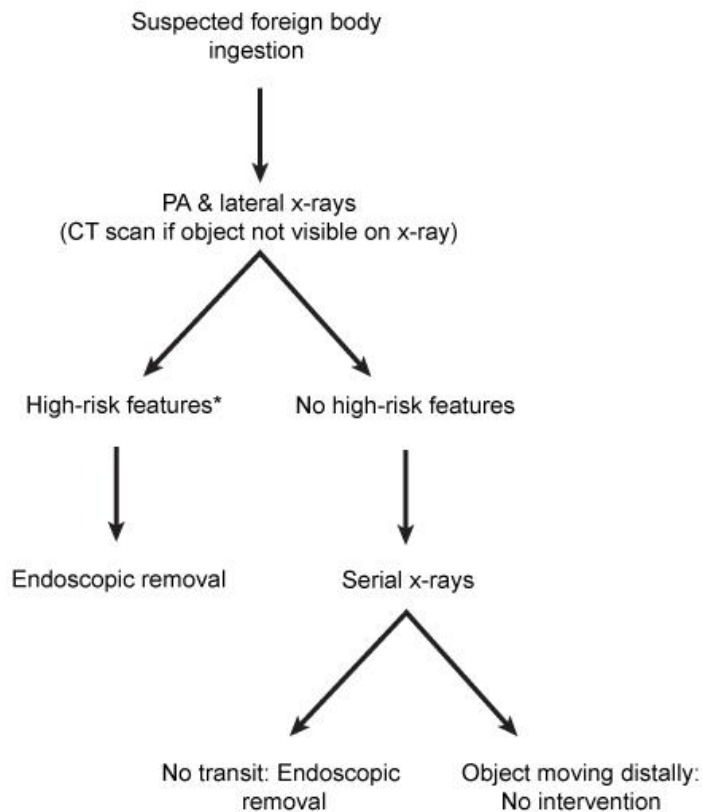
Management of food protein-induced allergic proctocolitis (FPIAP)



*Well-appearing infant age <6 months with blood-streaked stools and nonfocal examination

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Foreign body ingestion



PA = posteroanterior.

*Patient has respiratory or obstructive symptoms; object is a button battery, magnet, or sharp item.

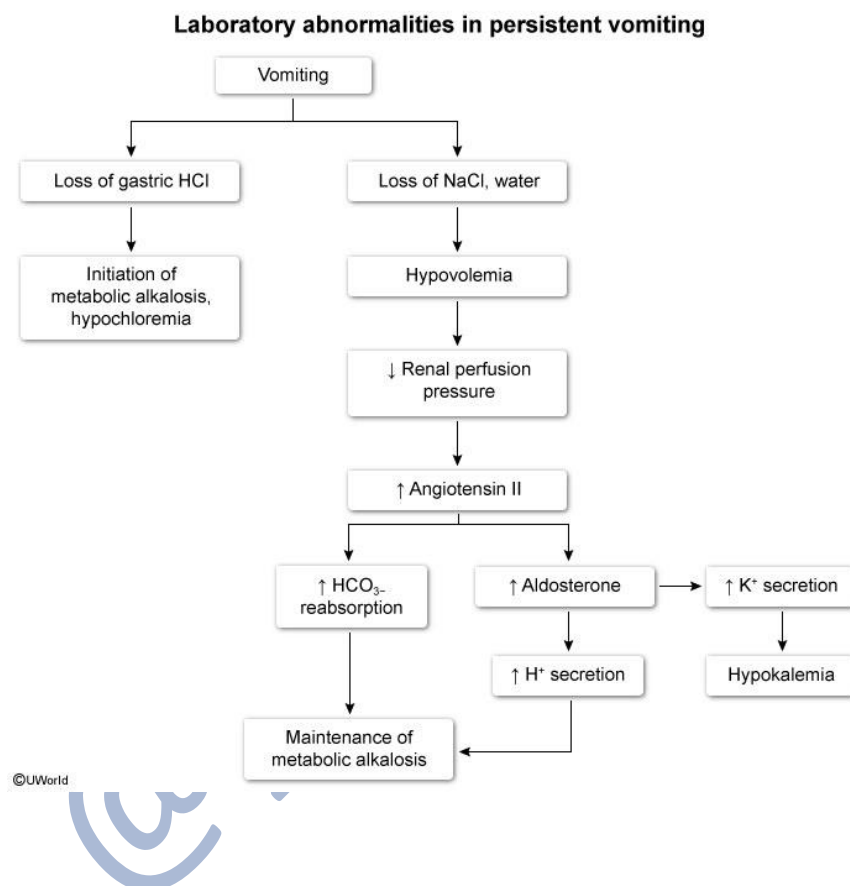
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Differentials of regurgitation and vomiting in infants

Differential diagnosis of regurgitation & vomiting in infants		
Diagnosis	Clinical features	Management
Gastroesophageal reflux	<ul style="list-style-type: none"> Physiologic <ul style="list-style-type: none"> Asymptomatic "Happy spitter" 	<ul style="list-style-type: none"> Reassurance Positioning therapy
	<ul style="list-style-type: none"> Pathologic (GERD) <ul style="list-style-type: none"> Failure to thrive Significant irritability Sandifer syndrome 	<ul style="list-style-type: none"> Thickened feeds Antacid therapy If severe, esophageal pH probe monitoring & upper endoscopy

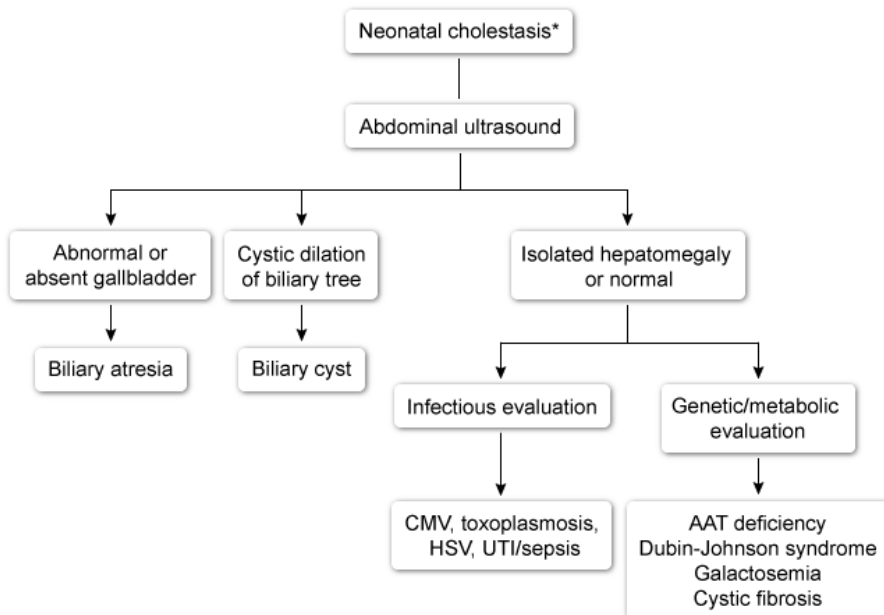
Milk protein allergy	<ul style="list-style-type: none"> • Regurgitation/vomiting • Eczema • Bloody stools 	<ul style="list-style-type: none"> • Elimination of dairy & soy protein from diet
Pyloric stenosis	<ul style="list-style-type: none"> • Projectile nonbilious vomiting • Olive-shaped abdominal mass • Dehydration, weight loss 	<ul style="list-style-type: none"> • Abdominal ultrasound • Pyloromyotomy

Lab abnormalities in persistent vomiting



Approach to neonatal cholestasis

Approach to neonatal cholestasis

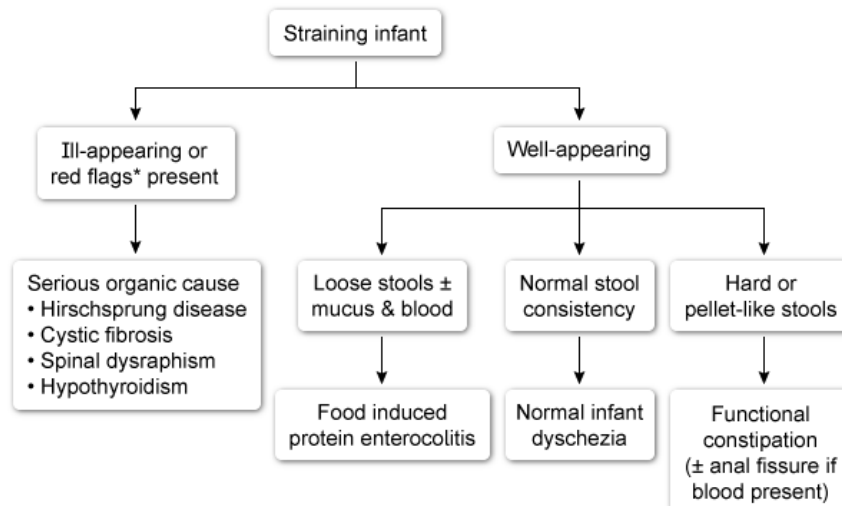


*Dark urine, acholic stools, conjugated hyperbilirubinemia.

AAT = alpha-1 antitrypsin; CMV = cytomegalovirus; HSV = herpes simplex virus; UTI = urinary tract infection. ©UWorld

Straining in infants

Approach to the straining infant

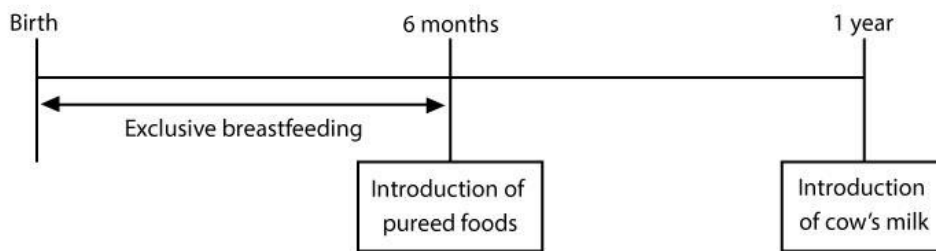


*Severe abdominal distention, abnormal rectal tone or sacral findings, delayed passage of meconium, failure to thrive

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Timeline of infant nutrition

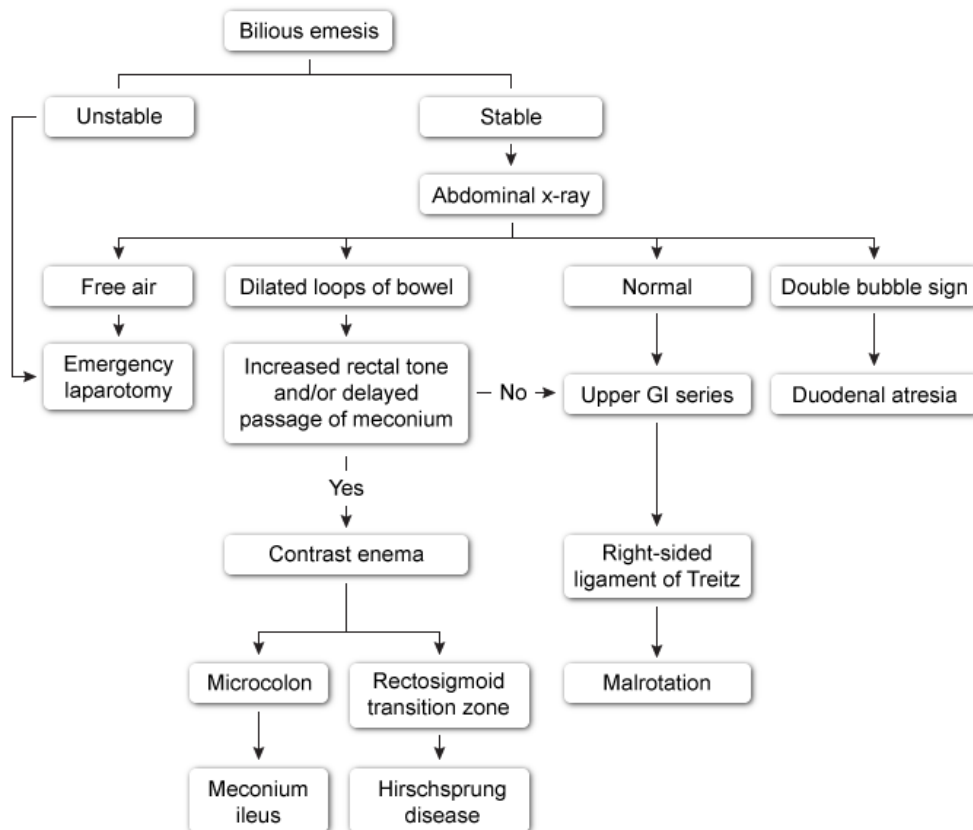
Timeline of infant nutrition



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Evaluation of bilious emesis

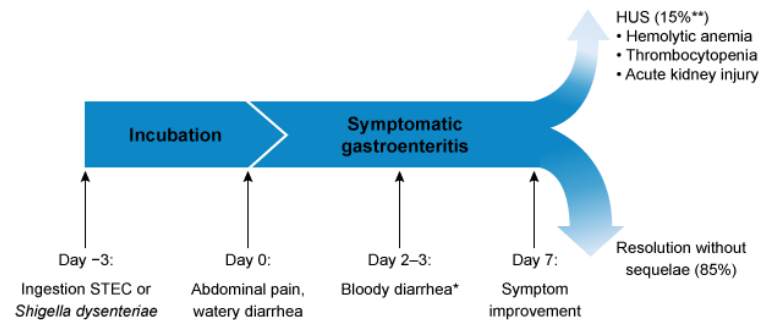
Evaluation of bilious emesis in the neonate



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HUS

Timeline of infection-induced HUS



*The presence of high fever makes *Shigella* more likely than STEC.

**Relative risk is higher with STEC (as compared to *Shigella*) or if STEC is treated with antibiotics.

HUS = hemolytic uremic syndrome; STEC = Shiga toxin-producing *Escherichia coli*.

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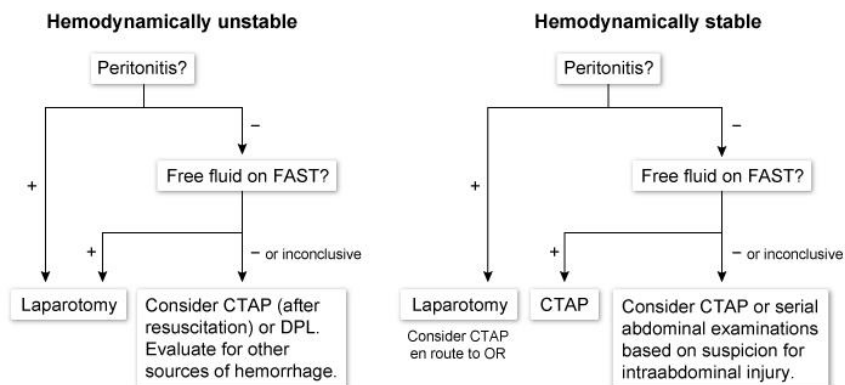
Surgery

Bariatric surgery

Preparation for bariatric surgery	
Indications	<ul style="list-style-type: none"> BMI ≥ 40 kg/m² BMI ≥ 35 kg/m² with serious comorbidity (eg, T2DM, hypertension, OSA) BMI ≥ 30 kg/m² with resistant T2DM or metabolic syndrome
Intake assessment	<ul style="list-style-type: none"> Review previous attempts at weight loss, diet, exercise habits Review psychiatric history, coping skills, readiness to change Review risk for cardiac (eg, CAD) and pulmonary (eg, OSA) disease
CAD = coronary artery disease; OSA = obstructive sleep apnea; T2DM = type 2 diabetes mellitus.	

Blunt abdominal trauma

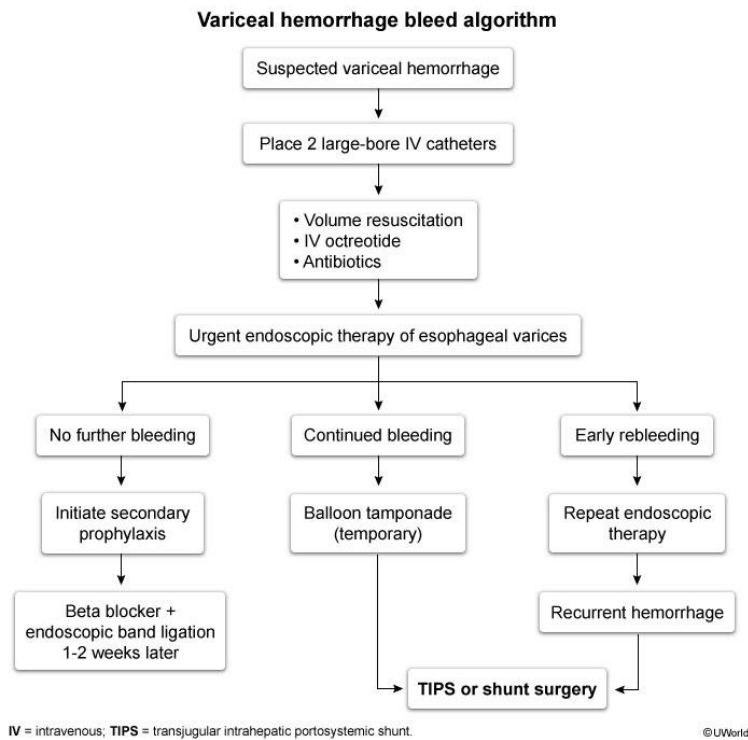
Blunt abdominal trauma



CTAP = CT scan of the abdomen & pelvis; DPL = diagnostic peritoneal lavage; FAST = Focused Assessment with Sonography for Trauma; OR = operating room.

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Variceal bleeding



Staging evaluation of rectal adenocarcinoma

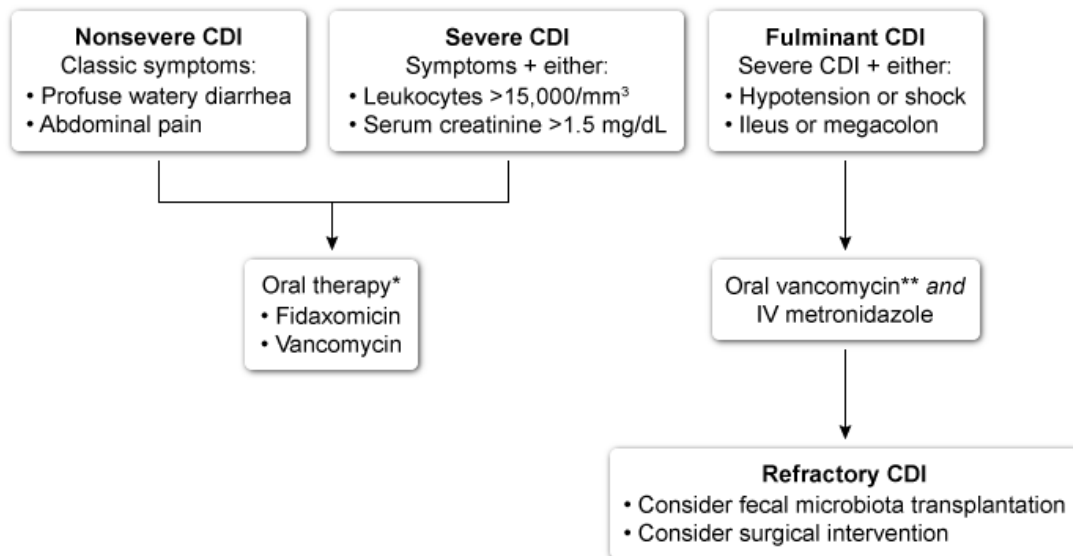
Staging evaluation for rectal adenocarcinoma	
Tumor markers	Carcinoembryonic antigen
Imaging	CT scan: chest, abdomen, pelvis
Endoscopy/direct visualization	Colonoscopy

Solid liver masses

Solid liver masses	
Focal nodular hyperplasia	<ul style="list-style-type: none"> Associated with anomalous arteries Arterial flow & central scar on imaging
Hepatic adenoma	<ul style="list-style-type: none"> Women on long-term oral contraceptives Possible hemorrhage or malignant transformation
Regenerative nodules	<ul style="list-style-type: none"> Acute or chronic liver injury (eg, cirrhosis)
Hepatocellular carcinoma	<ul style="list-style-type: none"> Systemic symptoms Chronic hepatitis or cirrhosis Elevated a fetoprotein
Liver metastasis	<ul style="list-style-type: none"> Single/multiple lesions Known extrahepatic malignancy

C diff infection management

Management of *Clostridioides difficile* infection



CDI = *Clostridioides difficile* infection; IV = intravenous.

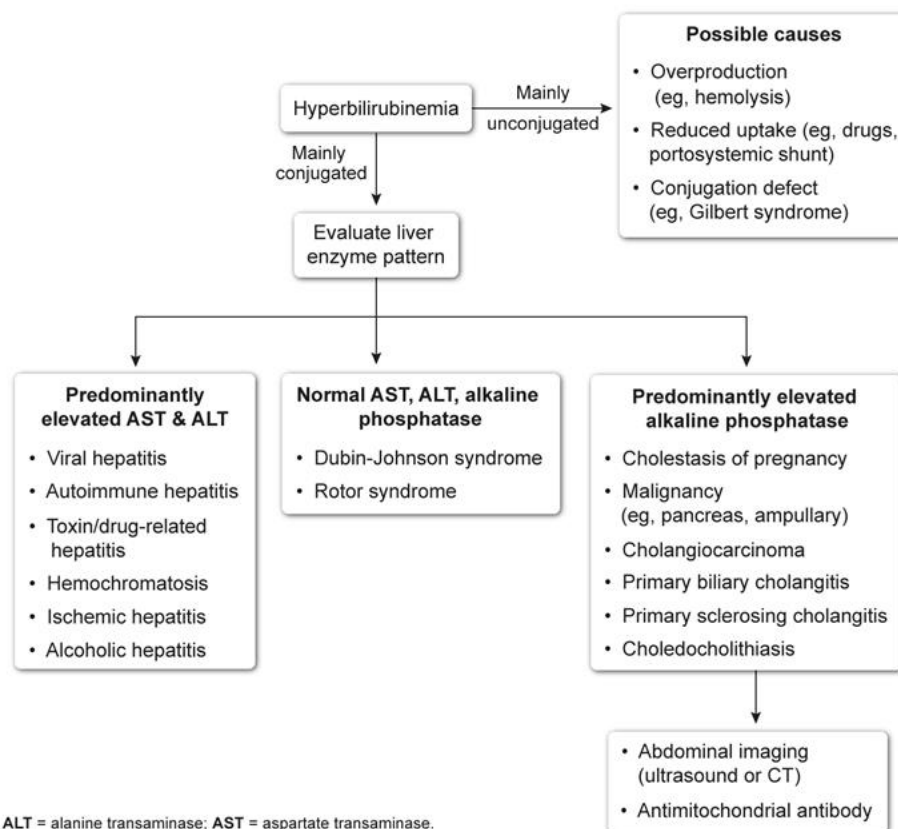
*Oral metronidazole can be considered for nonsevere CDI if fidaxomicin and vancomycin are unavailable.

**Consider adding vancomycin enemas if ileus is present.

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Approach to hyperbilirubinemia in adults

Approach to hyperbilirubinemia in adults

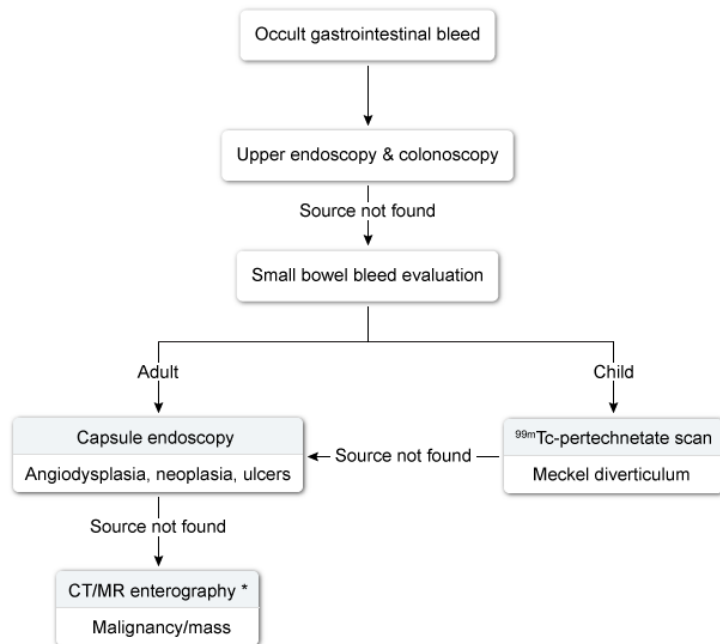


ALT = alanine transaminase; AST = aspartate transaminase.

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Age based occult GI bleed testing

Age-based evaluation of occult gastrointestinal bleeding

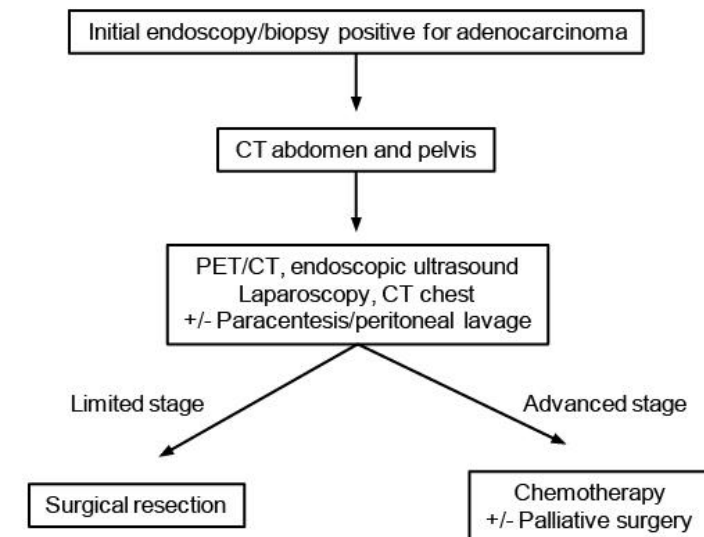


*Balloon-assisted enteroscopy may also be considered if source remains unidentified.

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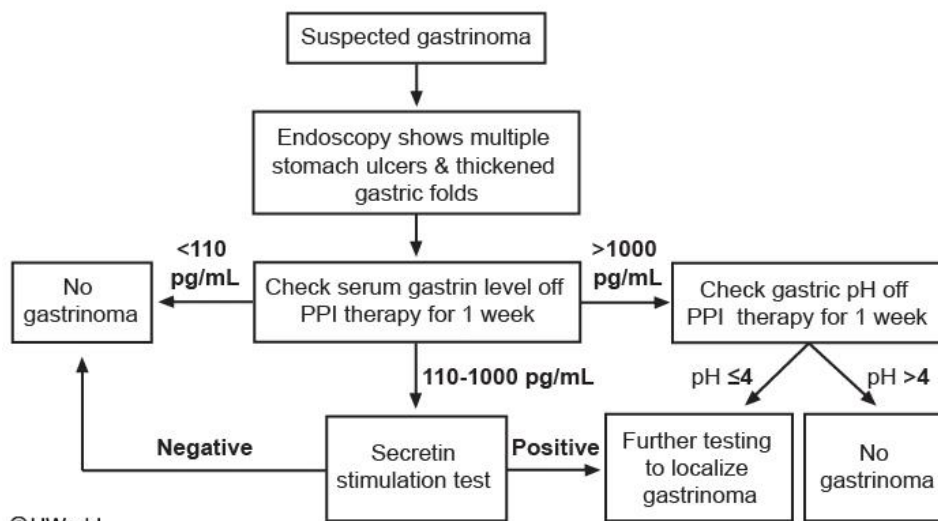
Staging of gastric adenocarcinoma

Staging of gastric adenocarcinoma



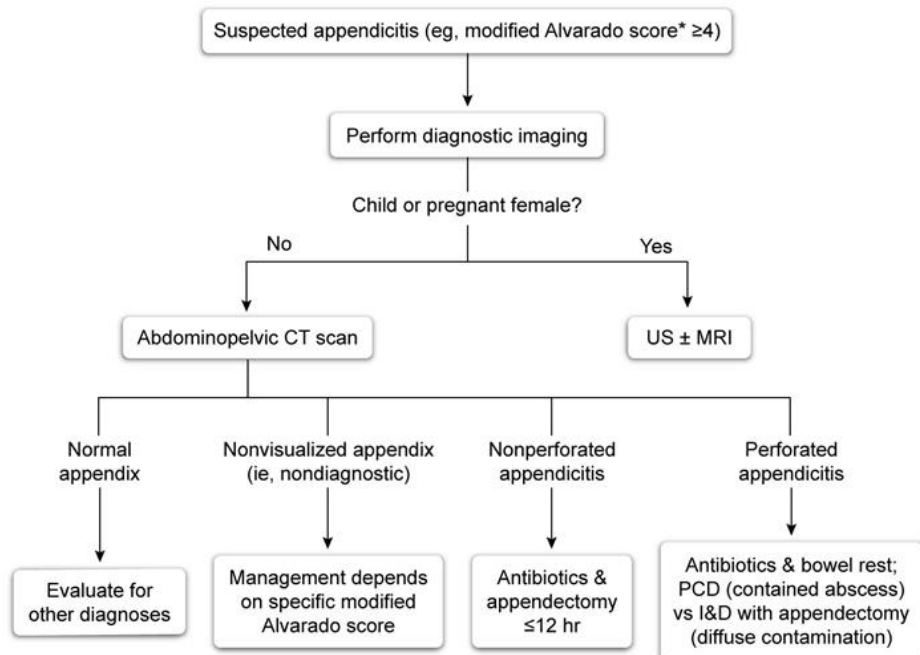
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Gastrinoma evaluation



Appendicitis

Management of suspected appendicitis



*Modified Alvarado score

1 point each: migratory RLQ pain, anorexia, nausea or vomiting, RLQ rebound tenderness, fever $>37.5^{\circ}\text{C}$ (99.5°F).
2 points each: RLQ tenderness, leukocytes $>10,000/\text{mm}^3$.

I&D = irrigation & drainage; PCD = percutaneous drainage; RLQ = right lower quadrant; US = ultrasound.

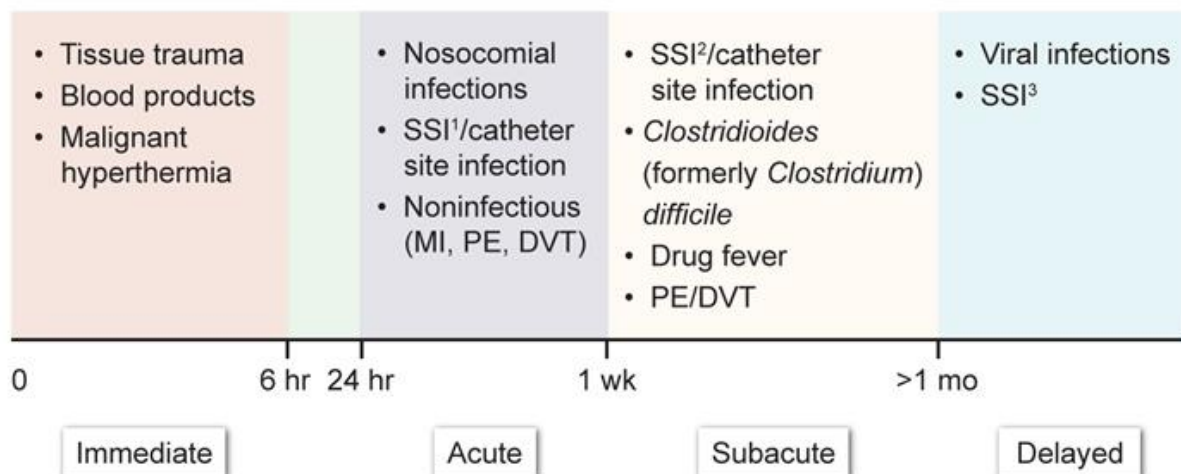
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Ascitic fluid characteristics

Ascites fluid characteristics	
Color	<ul style="list-style-type: none"> • Bloody: trauma, malignancy, TB (rarely) • Milky: chylous • Turbid: possible infection • Straw color: likely more benign causes
Neutrophils	<ul style="list-style-type: none"> • $\geq 250/\text{mm}^3$: peritonitis (secondary or spontaneous bacterial)
Total protein	<ul style="list-style-type: none"> • ≥ 2.5 g/dL (high-protein ascites) <ul style="list-style-type: none"> ◦ CHF, constrictive pericarditis, peritoneal carcinomatosis, TB, Budd-Chiari syndrome, fungal • < 2.5 g/dL (low-protein ascites) <ul style="list-style-type: none"> ◦ Cirrhosis, nephrotic syndrome
SAAG	<ul style="list-style-type: none"> • ≥ 1.1 g/dL (indicates portal hypertension) <ul style="list-style-type: none"> ◦ Cardiac ascites, cirrhosis, Budd-Chiari syndrome • < 1.1 g/dL (absence of portal hypertension) <ul style="list-style-type: none"> ◦ TB, peritoneal carcinomatosis, pancreatic ascites, nephrotic syndrome
CHF = congestive heart failure; SAAG = serum-ascites albumin gradient; TB = tuberculosis.	

Postoperative fever

Timeline of cause of postoperative fever



SSI¹ = Due to group A *Streptococcus* (GAS) or *Clostridium perfringens*

SSI² = Due to other organisms (not GAS or *C perfringens*)

SSI³ = Due to indolent organisms

DVT = deep venous thrombosis; MI = myocardial infarction; PE = pulmonary embolism; SSI = surgical site infection.

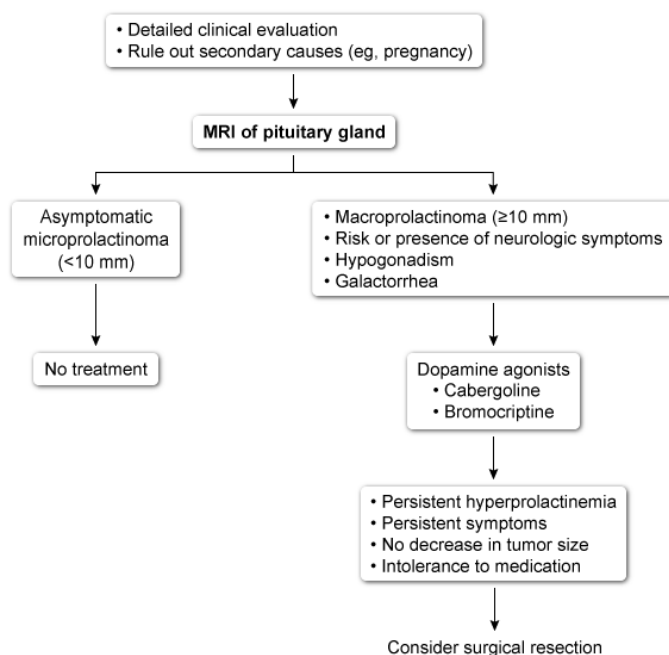
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6. Endocrinology

Medicine

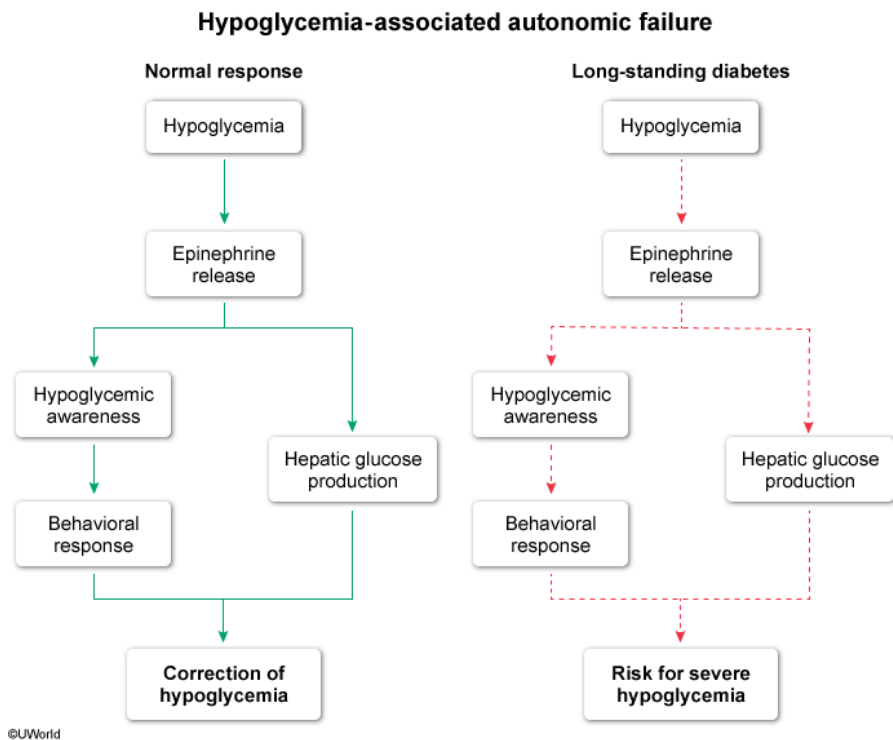
Management of hyperprolactinemia

Management of hyperprolactinemia in premenopausal women

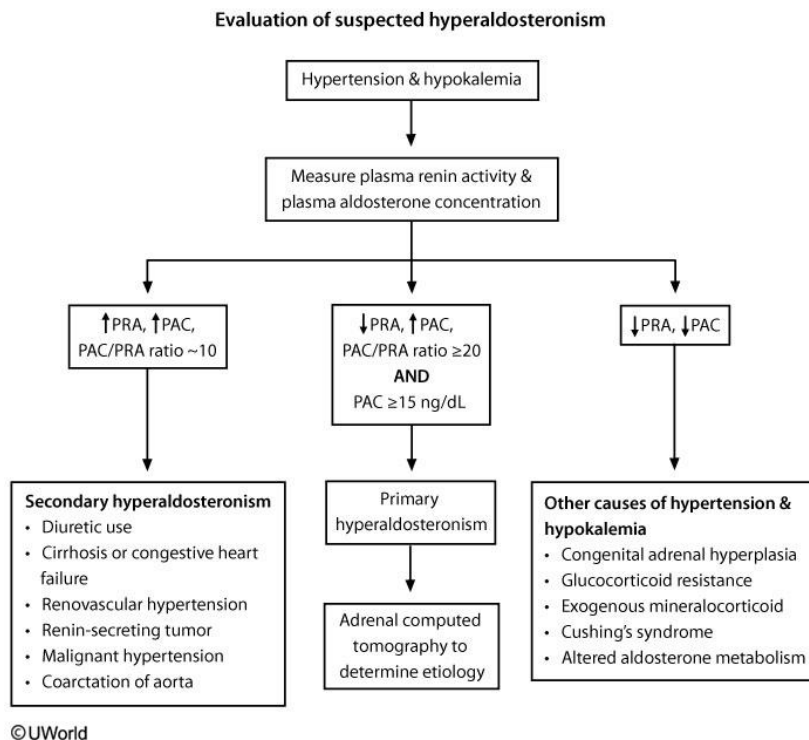


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Hypoglycemia associated sympathetic failure

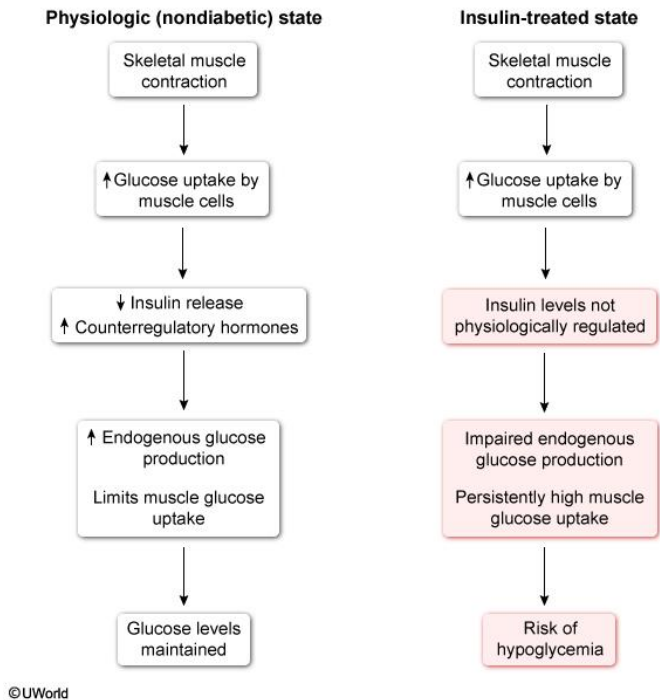


Evaluation of suspected hyperaldosteronism

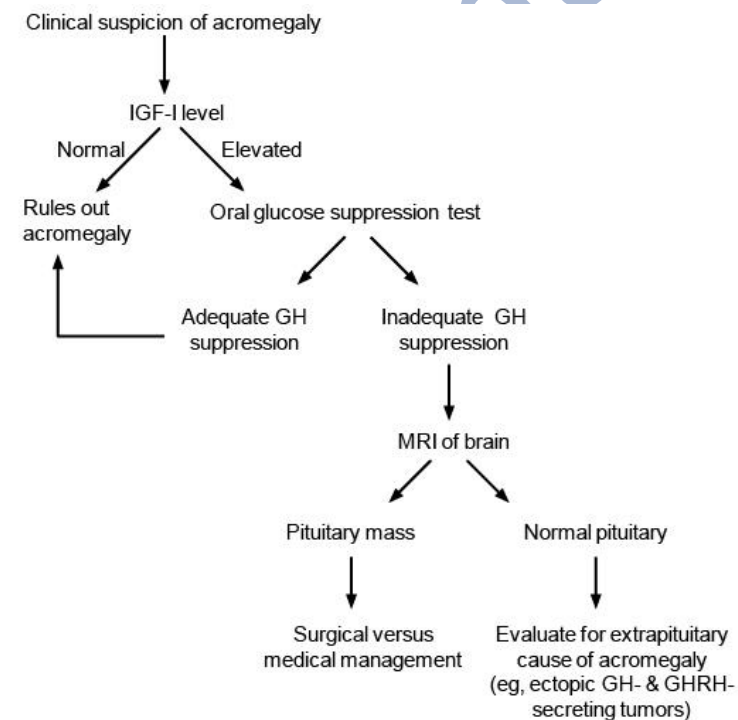


Exercise induced hypoglycemia

Effect of exercise on insulin & glucose

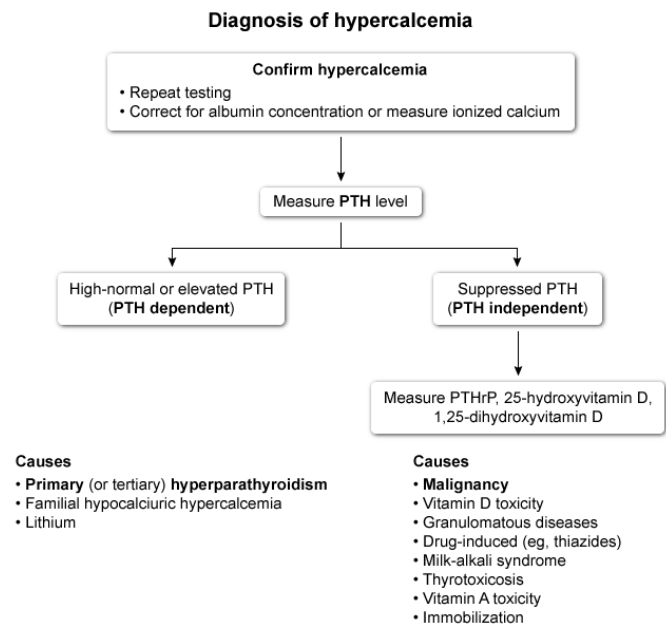


Evaluation of suspected acromegaly

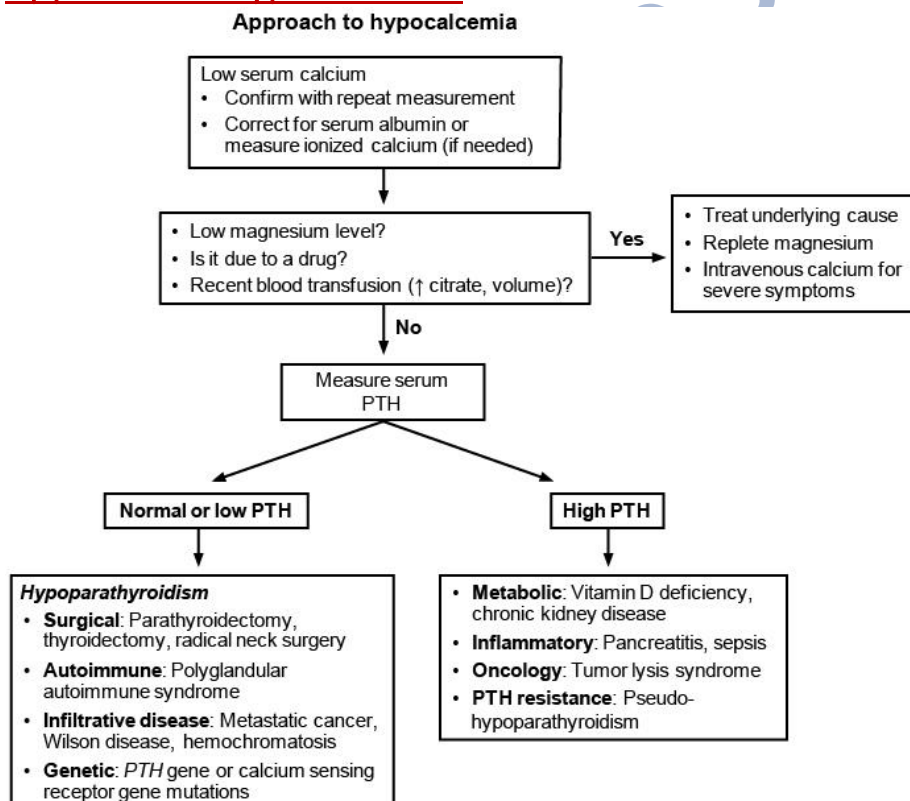


GH = growth hormone; GHRH = growth hormone-releasing hormone; IGF-1 = insulin-like growth factor 1.
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Differentials of hypercalcemia

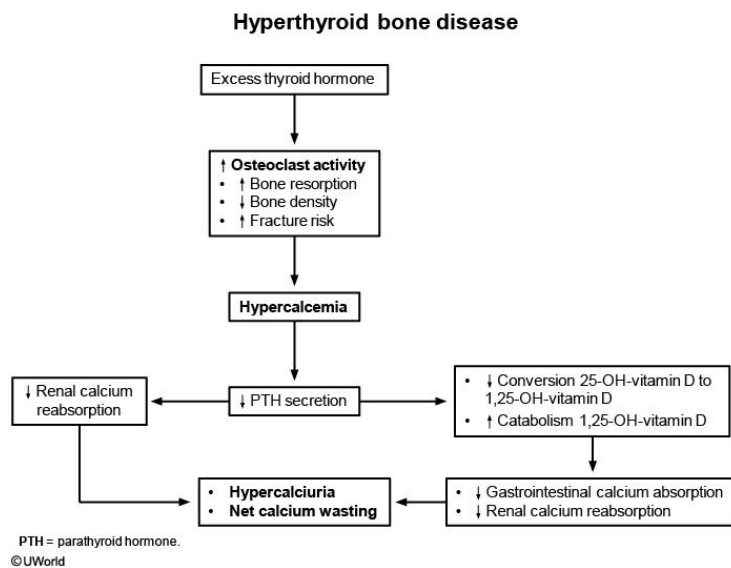


Approach to hypocalcemia

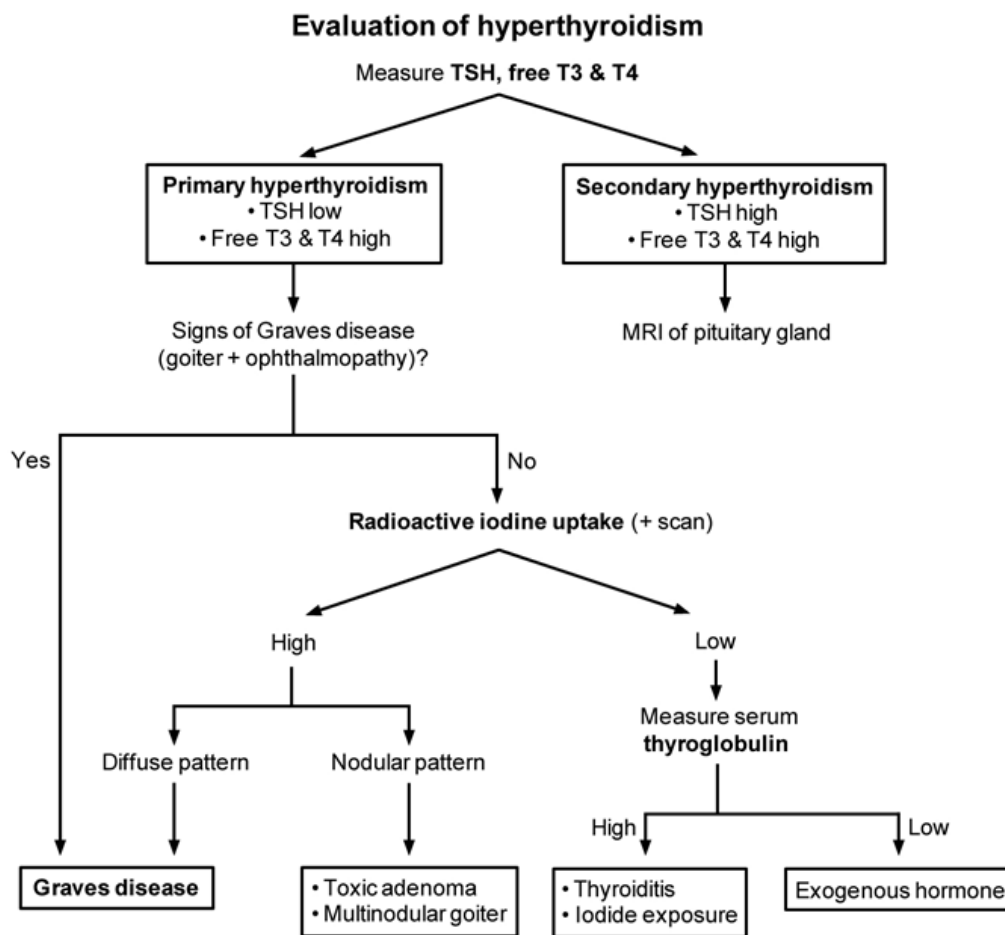


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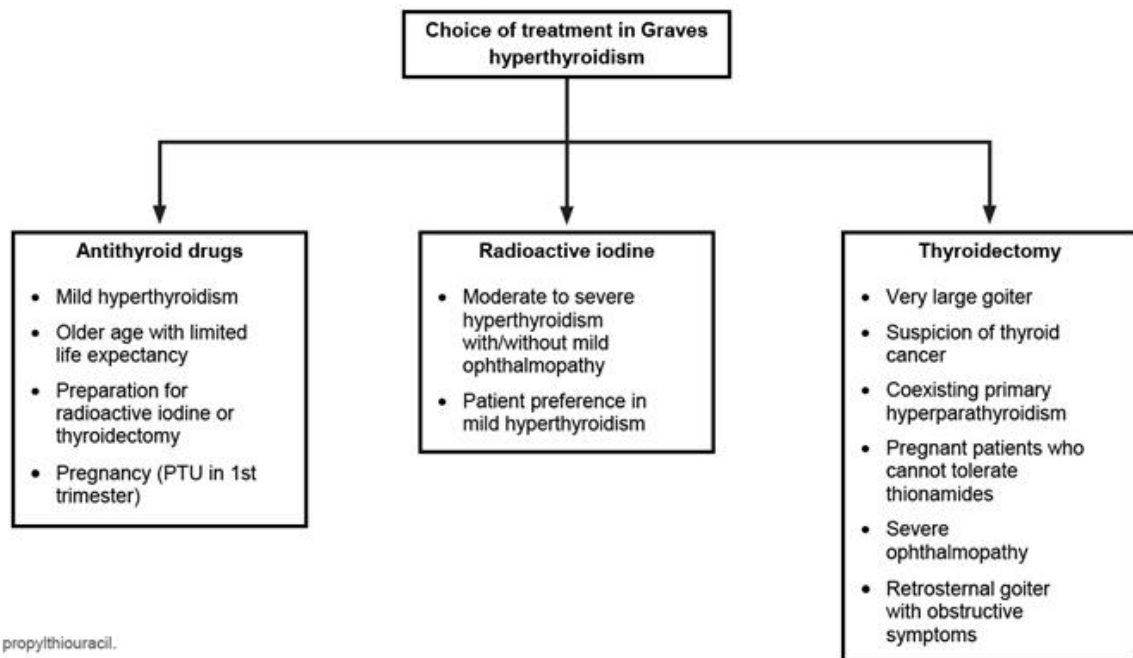
Hyperthyroid bone



Evaluation of suspected hyperthyroidism



Treatment of choice in hyperthyroidism

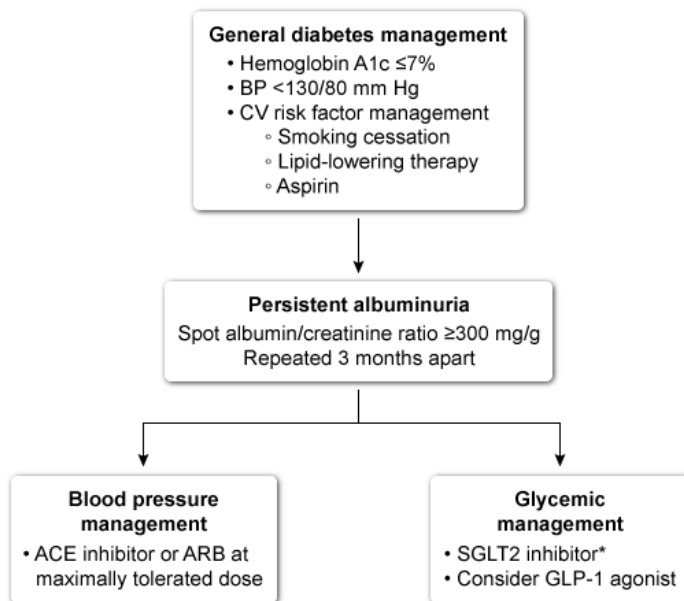


PTU = propylthiouracil.

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Management of diabetic kidney

Prevention & management of diabetic kidney disease

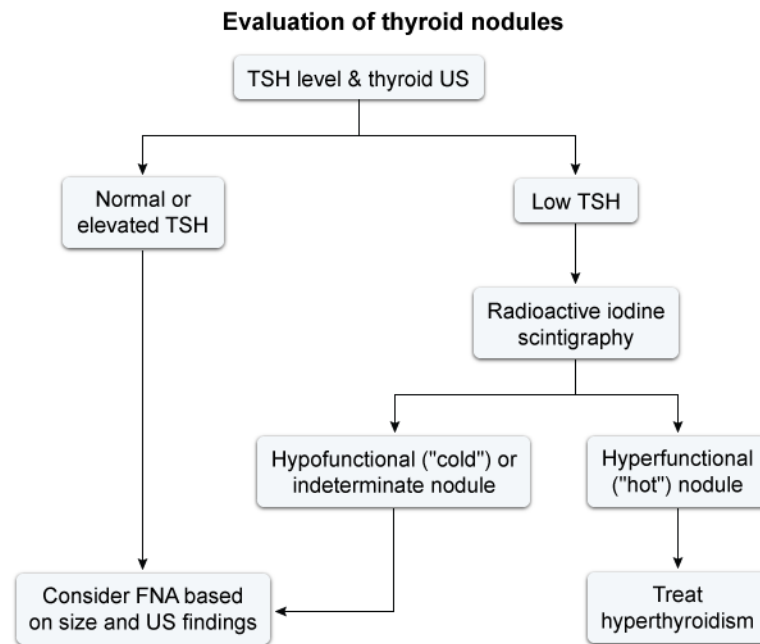


*Contraindicated if GFR < 30 mL/min/1.73 m².

ARB = Angiotensin II receptor blocker; CV = cardiovascular;
SGLT2 = sodium-glucose cotransporter 2 inhibitor.

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Thyroid nodule evaluation

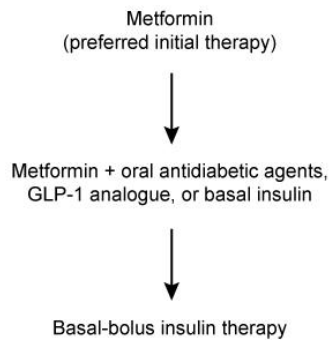


FNA = fine-needle aspiration; US = ultrasound.

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DMT2 treatment

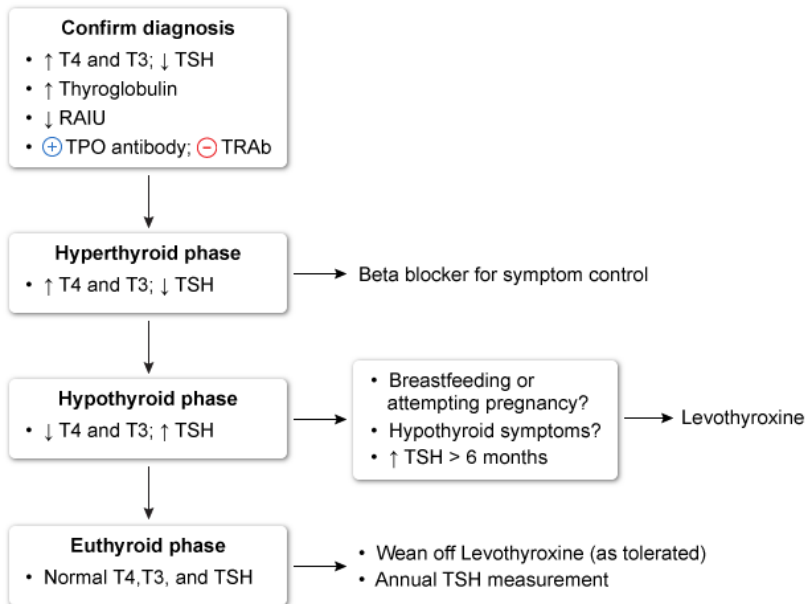
Progressive therapeutic intensification in type 2 diabetes mellitus



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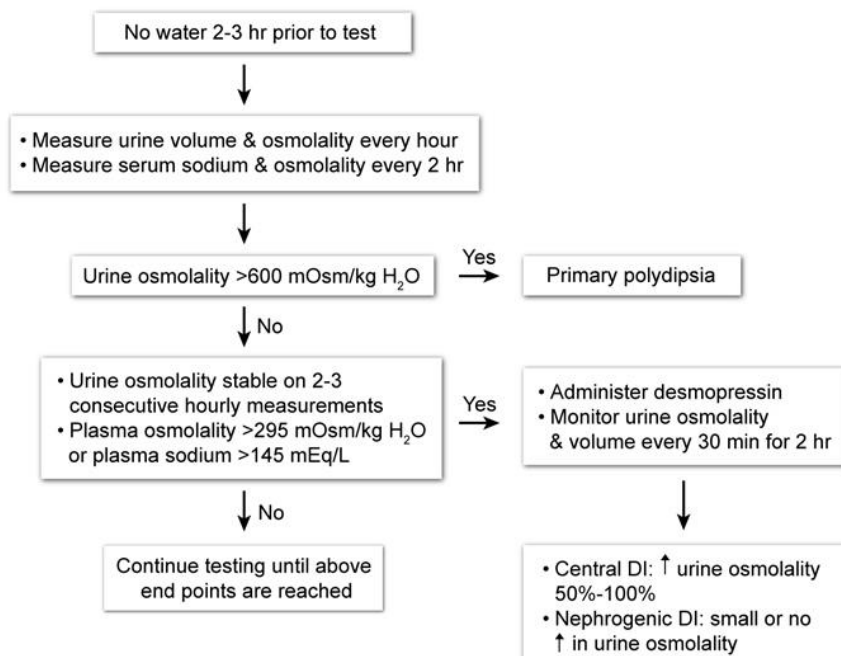
Postpartum thyroiditis

Management of postpartum thyroiditis

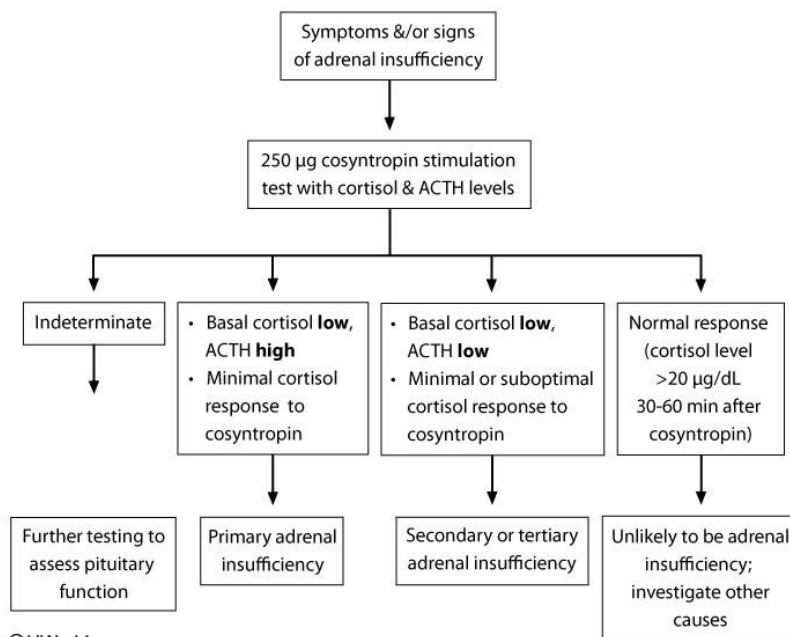


Water deprivation test

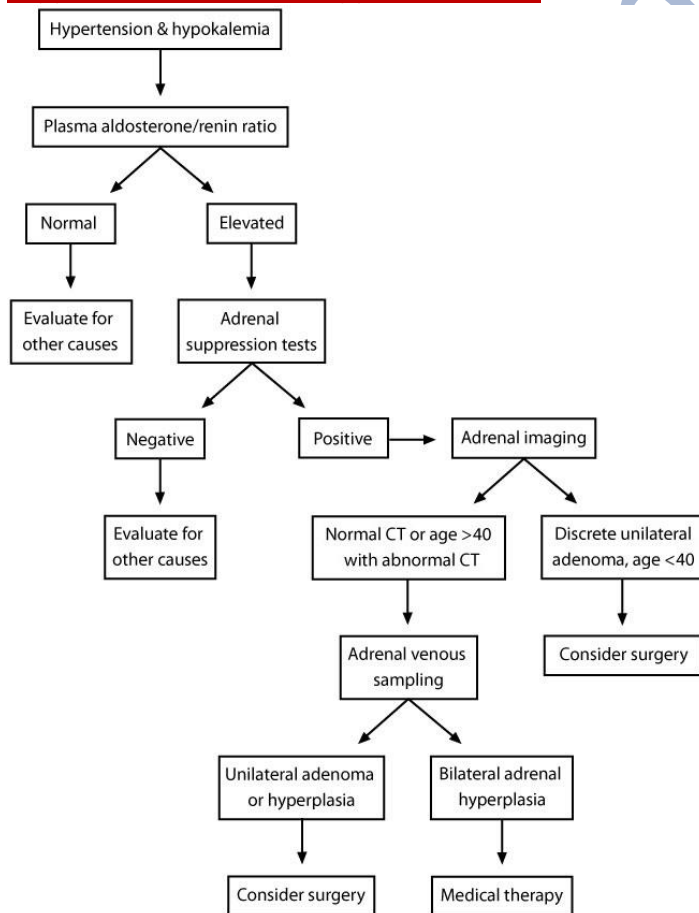
Water deprivation test



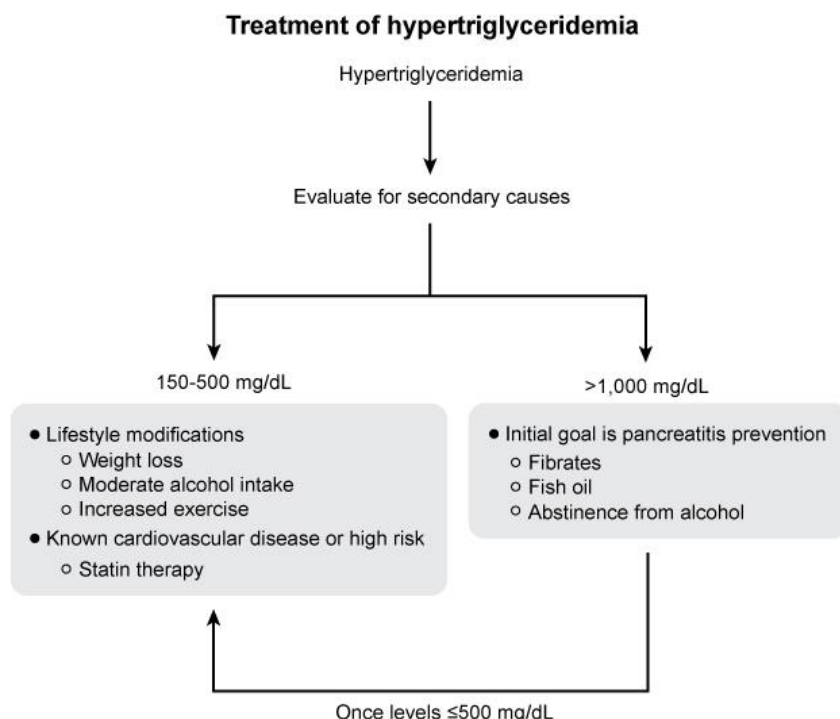
Adrenal insufficiency diagnosis



Hypokalemia and hypertension



Hypertriglyceridemia

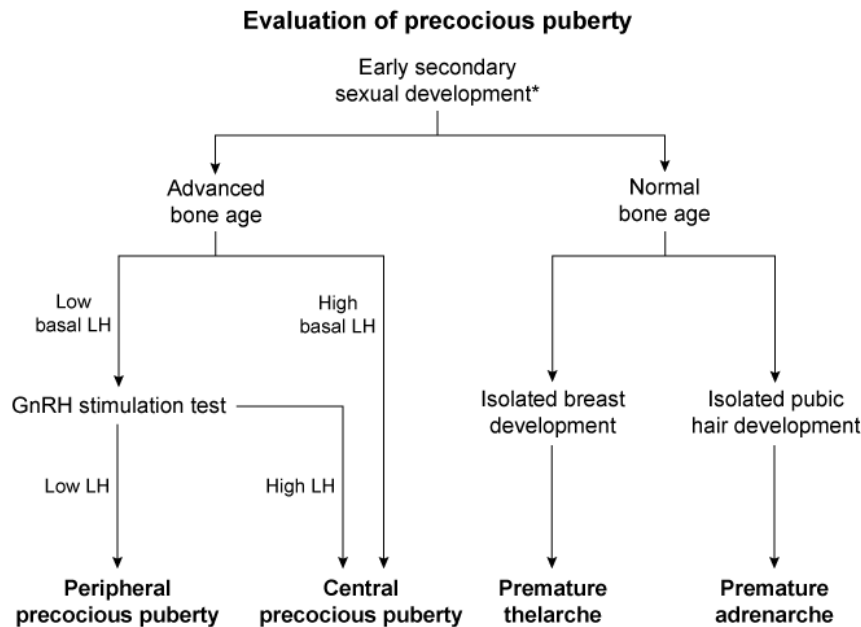


Management of diabetic ketoacidosis

Management of diabetic ketoacidosis	
IV fluids	<ul style="list-style-type: none"> • Rapid infusion of 0.9% normal saline • Add dextrose 5% when serum glucose is ≤ 200 mg/dL
Insulin	<ul style="list-style-type: none"> • Start continuous IV insulin infusion; hold if $K < 3.3$ mEq/L • Switch to SQ (basal bolus) insulin for the following: able to eat, glucose < 200 mg/dL, anion gap < 12 mEq/L & serum $HCO_3^- \geq 15$ mEq/L • Overlap SQ & IV insulin by 1-2 hr
Potassium	<ul style="list-style-type: none"> • Add IV K if serum $K^+ < 5.3$ mEq/L; hold if ≥ 5.3 mEq/L • Nearly all patients' K^+ depleted, even with hyperkalemia
Bicarbonate	<ul style="list-style-type: none"> • Consider for patients with pH ≤ 6.9
Phosphate	<ul style="list-style-type: none"> • Consider for serum phosphate < 1.0 mg/dL, cardiac dysfunction, or respiratory depression • Monitor serum calcium frequently
IV = intravenous; SQ = subcutaneous.	

Pediatrics

Evaluation of precocious puberty



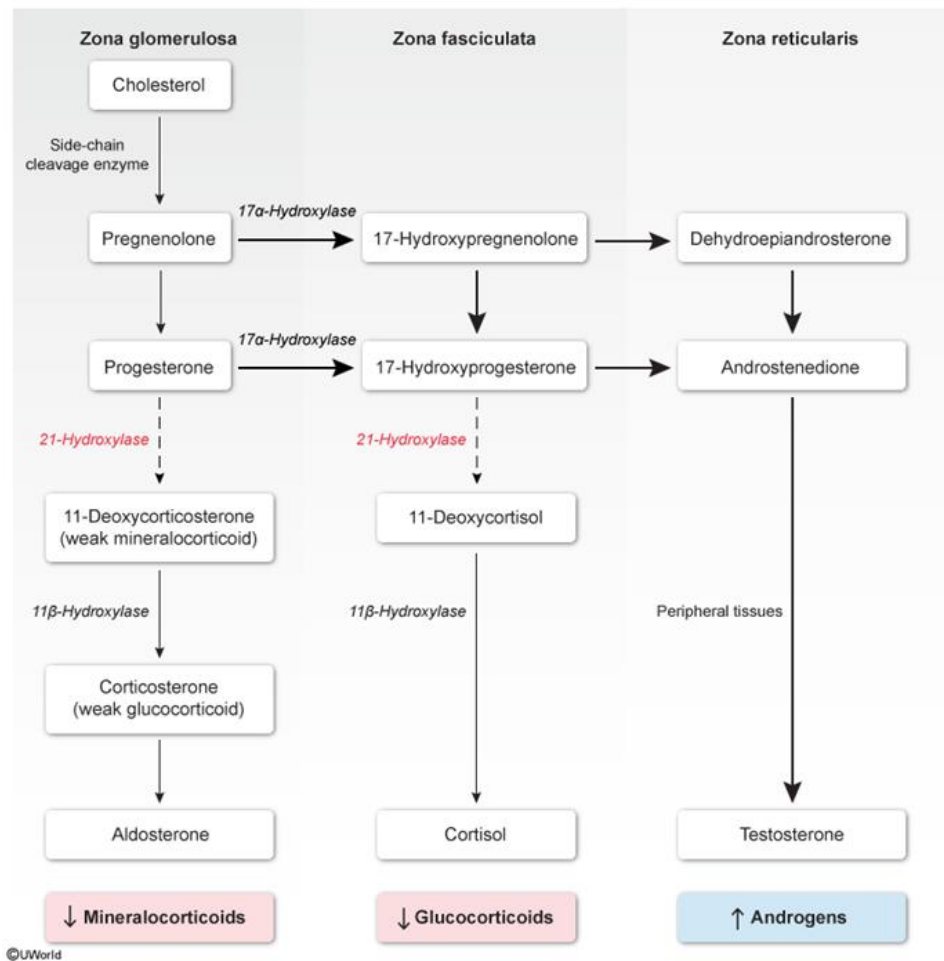
*Secondary sexual development in girls age <8 or boys age <9.

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Non classic CAH

This patient's early onset of secondary sexual characteristics, advanced bone age, and low LH level are suggestive of peripheral precocious puberty, likely **nonclassic congenital adrenal hyperplasia (CAH)** secondary to 21-hydroxylase (*CYP21A2*) deficiency. Similar to classic CAH, the 21-hydroxylase deficiency impairs the conversion of 17-hydroxyprogesterone to 11-deoxycortisol; 17-hydroxyprogesterone is shunted toward adrenal androgen overproduction (ie, precocious puberty). However, in patients with nonclassic CAH, sufficient glucocorticoid and mineralocorticoid levels are maintained; therefore, patients have normal electrolytes (no salt wasting).

21-Hydroxylase deficiency



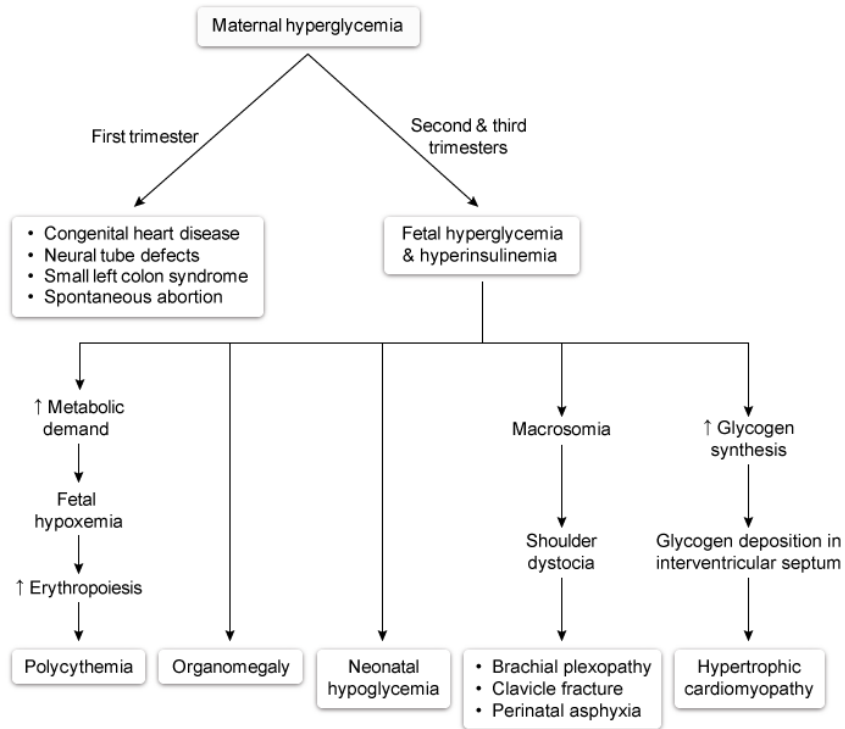
Classic CAH

Classic congenital adrenal hyperplasia	
Pathogenesis	<ul style="list-style-type: none"> Autosomal recessive 21-Hydroxylase deficiency
Clinical presentation	<ul style="list-style-type: none"> Ambiguous genitalia in girls Salt-wasting syndrome* <ul style="list-style-type: none"> Affects most girls & boys Hypotension, dehydration & vomiting
Laboratory findings	<ul style="list-style-type: none"> ↓ Sodium, ↑ potassium, ↓ glucose ↑ 17-Hydroxyprogesterone
Treatment	<ul style="list-style-type: none"> Glucocorticoids & mineralocorticoids High-salt diet Psychosocial support

***Clinical symptoms & electrolyte abnormalities develop at age 1-2 weeks.**

Infant of a diabetic mother

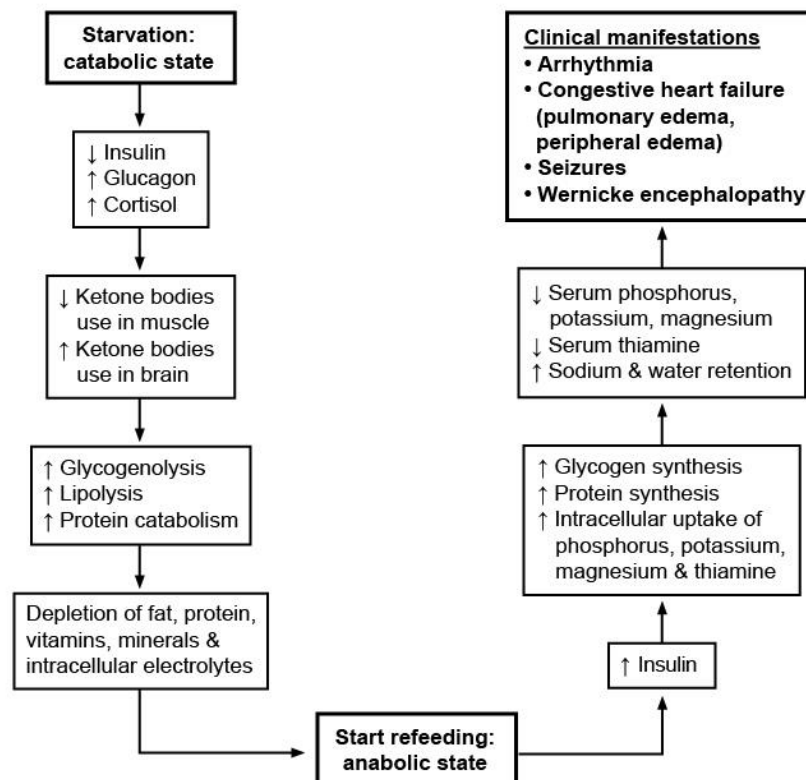
Infant of mother with diabetes mellitus: complications



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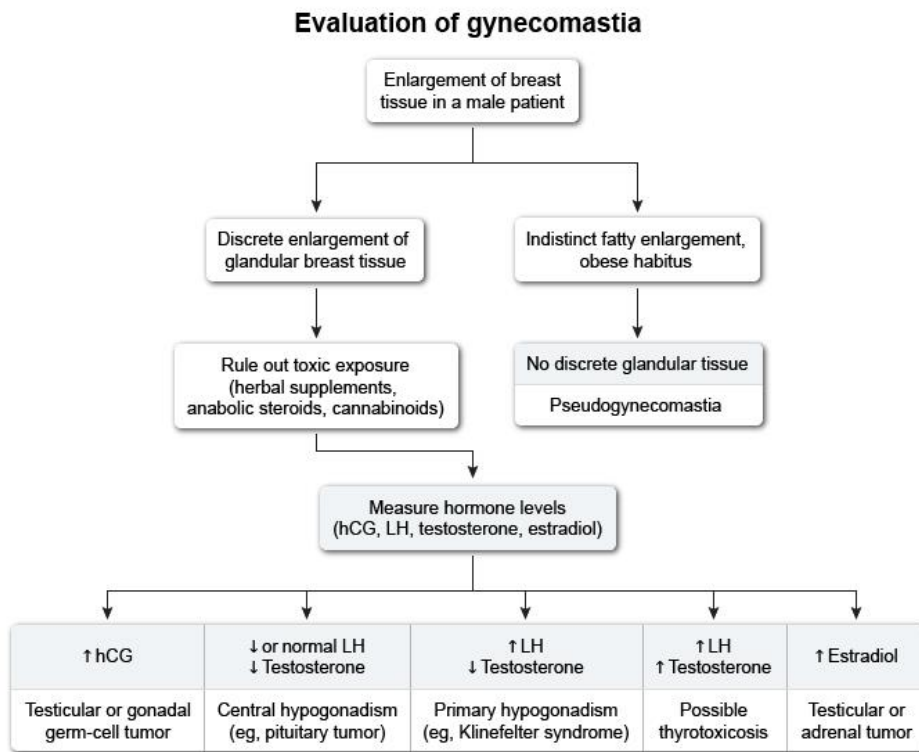
Refeeding syndrome

Pathogenesis of refeeding syndrome



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Evaluation of gynecomastia



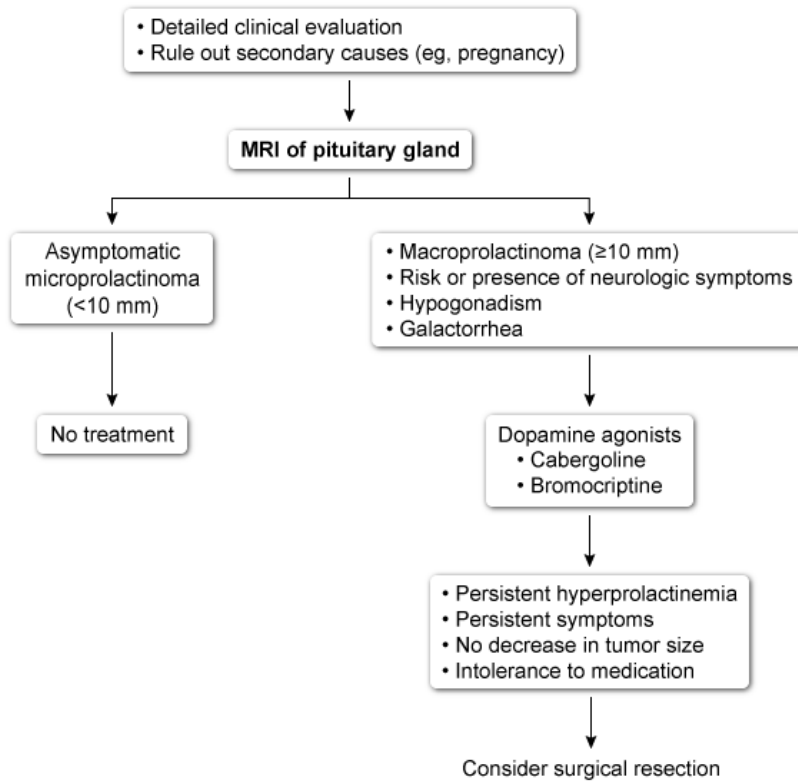
hCG = Human chorionic gonadotropin, LH = Luteinizing hormone

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Surgery

Management of hyperprolactinoma

Management of hyperprolactinemia in premenopausal women



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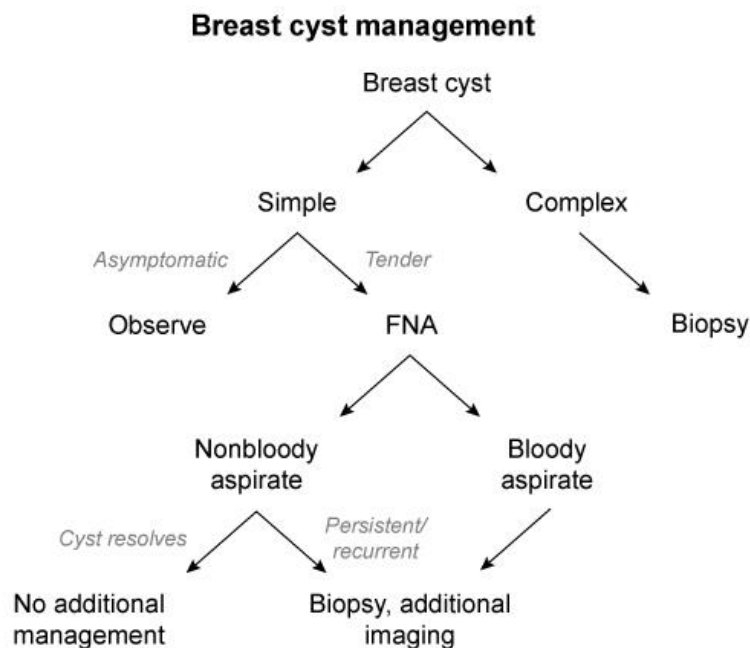
7. Reproductive system

Malignant testicular tumors

Malignant testicular neoplasms		
Germ cell (95%)	Seminoma	<ul style="list-style-type: none"> Retain features of spermatogenesis β-hCG, AFP usually negative
	Nonseminoma	<ul style="list-style-type: none"> ≥ 1 partially differentiated cells: yolk sac, embryonal carcinoma, teratoma, and/or choriocarcinoma β-hCG, AFP usually positive
Stromal (5%)	Leydig	<ul style="list-style-type: none"> Often produces excessive estrogen (gynecomastia) or testosterone (acne) Can cause precocious puberty
	Sertoli	<ul style="list-style-type: none"> Rare Occasionally associated with excessive estrogen secretion (eg, gynecomastia)

AFP = alpha-fetoprotein.

Breast cyst management

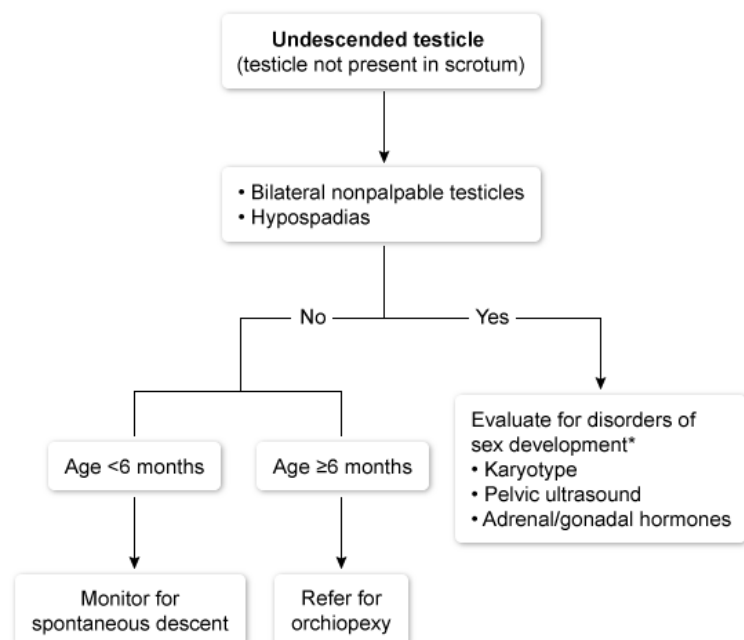


FNA= fine-needle aspiration.

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Management of cryptorchidism

Management of cryptorchidism in infants

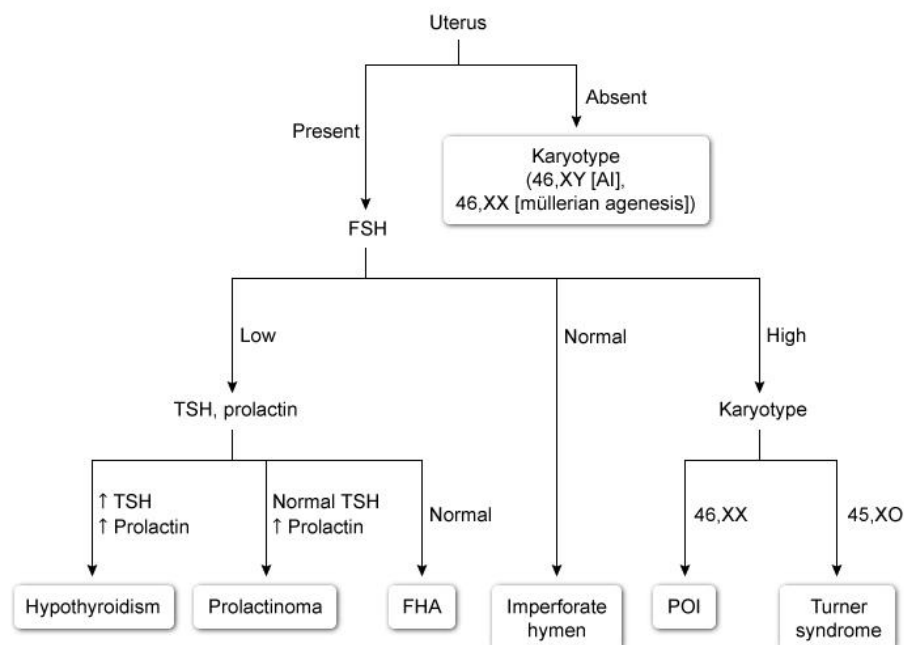


*eg, congenital adrenal hyperplasia, hypogonadotrophic hypogonadism, androgen insensitivity, gonadal dysgenesis.

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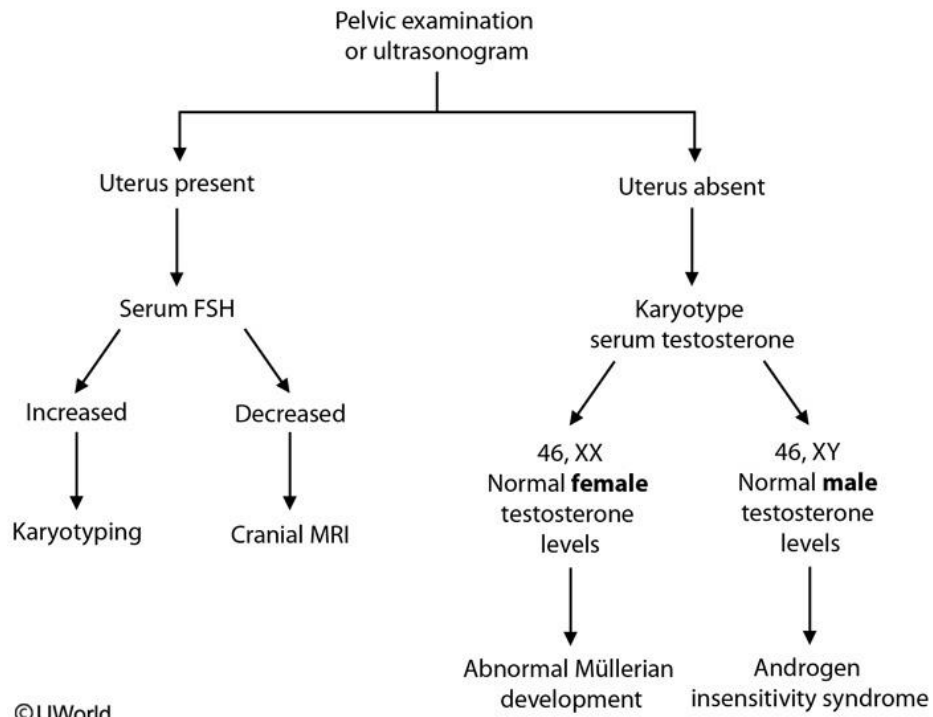
Primary amenorrhea evaluation

Primary amenorrhea evaluation



AI = androgen insensitivity; FHA = functional hypothalamic amenorrhea; POI = primary ovarian insufficiency.

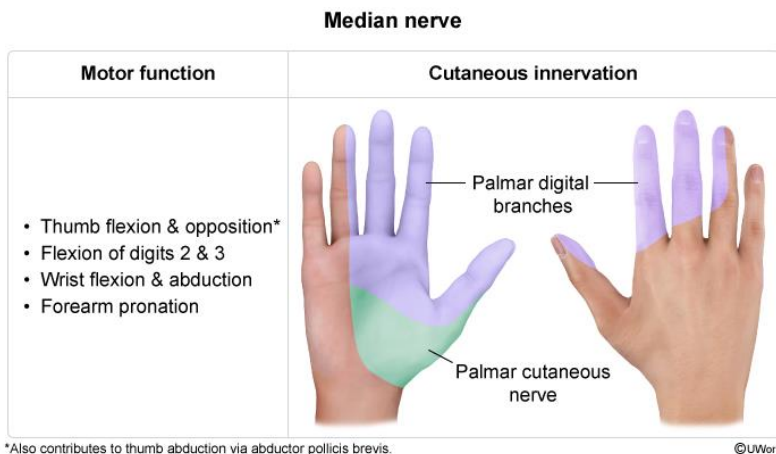
Evaluation of primary amenorrhea



8. Rheumatology and sports

Medicine

Nerves

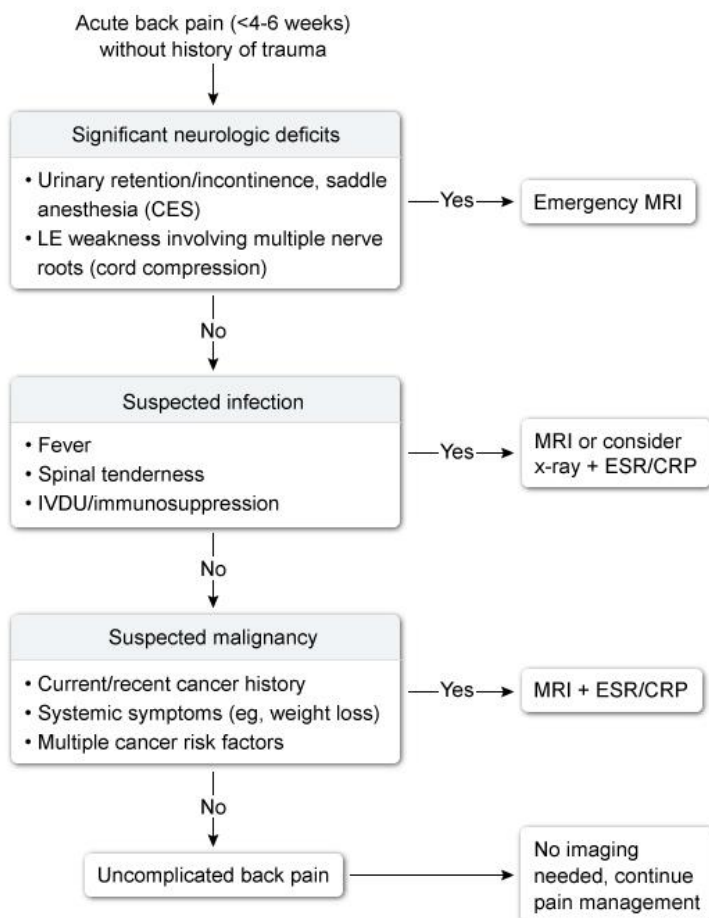


RA vs osteoarthritis

Osteoarthritis vs rheumatoid arthritis		
	Osteoarthritis	Rheumatoid arthritis
Age of onset	>40; increases with age	40-60; often younger
Joint involvement	<ul style="list-style-type: none"> • Knees & hips • DIP joint • First CMC joint 	<ul style="list-style-type: none"> • MCP joint • PIP joint • Wrists
Morning stiffness	None/brief	Prolonged
Systemic symptoms	Absent	<ul style="list-style-type: none"> • Fever • Fatigue • Weight loss
Examination	<ul style="list-style-type: none"> • Hard, bony enlargement of joints 	<ul style="list-style-type: none"> • Soft/spongy, warm joints
X-ray	<ul style="list-style-type: none"> • Narrowed joint space • Osteophytes 	<ul style="list-style-type: none"> • Periarticular erosions
CMC = carpometacarpal; DIP = distal interphalangeal; MCP = metacarpophalangeal; PIP = proximal interphalangeal.		

Non-traumatic back pain management

Imaging in nontraumatic acute back pain

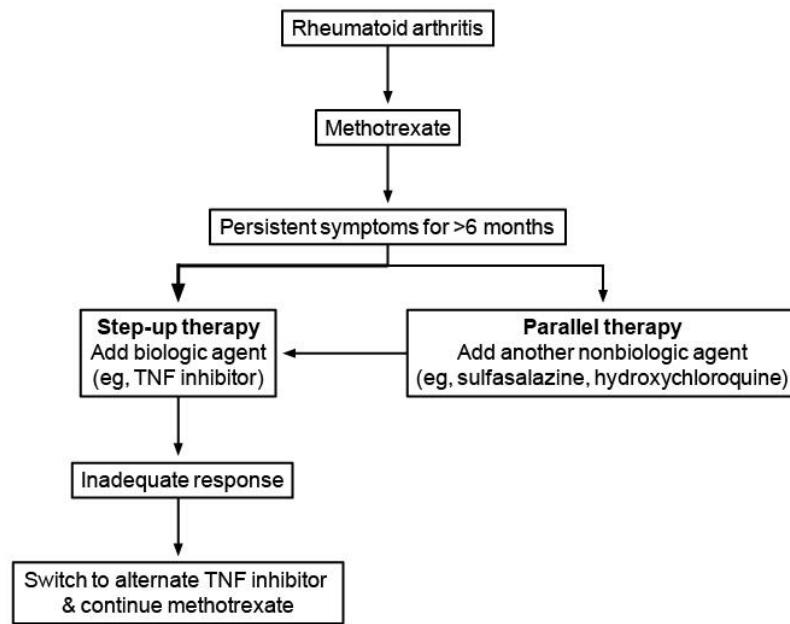


CES = cauda equina syndrome; CRP = C-reactive protein;
ESR = erythrocyte sedimentation rate; IVDU = intravenous drug use; LE = lower extremity.
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Joint fluid

Joint fluid characteristics				
	Normal	Noninflammatory (eg, OA)	Inflammatory (eg, crystals, RA)	Septic joint
Appearance	Clear	Clear	Translucent or opaque	Opaque
WBCs (mm ³)	<200	200-2,000	2,000-100,000	50,000-150,000
PMNs	<25%	25%	Often >50%	>80%-90%
OA = osteoarthritis; PMNs = polymorphonuclear leukocytes; RA = rheumatoid arthritis; WBCs = white blood cells.				

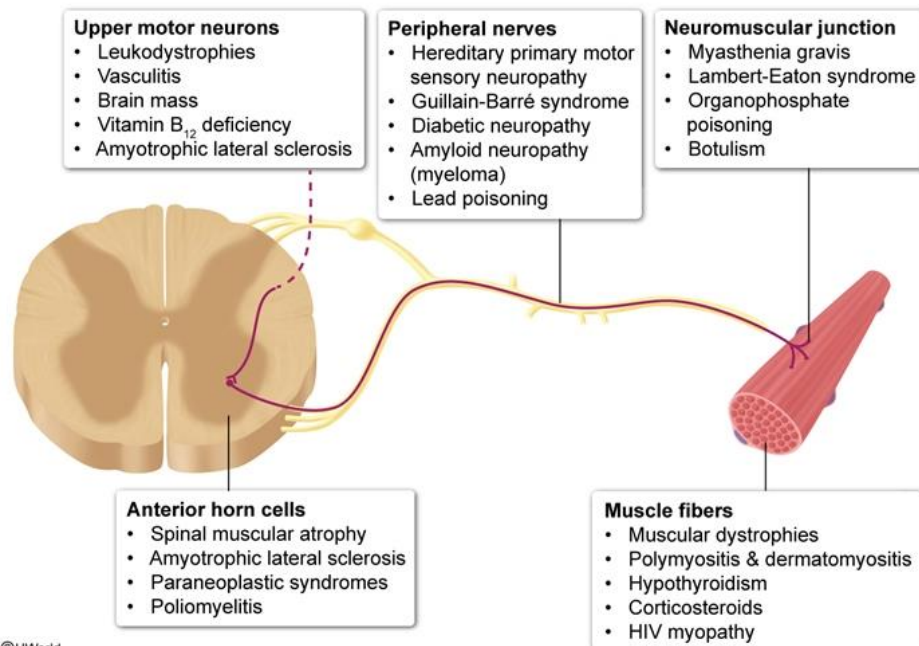
Rheumatoid arthritis



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Muscle weaknesses

Differential diagnosis of neuromuscular weakness



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Surgery

Differentials of heel pain

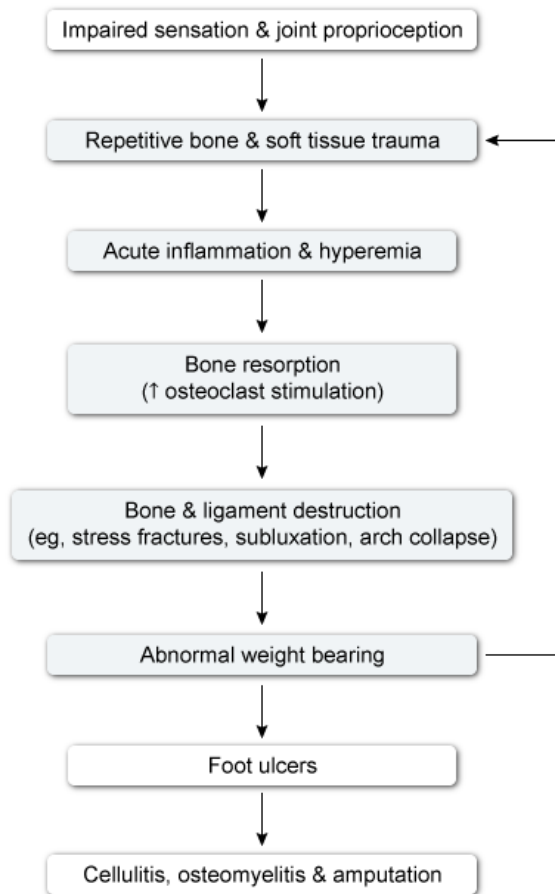
Differential diagnosis of heel pain	
Plantar fasciitis	<ul style="list-style-type: none"> Maximal pain on first stepping out of bed Pain & tenderness at medial plantar heel, worse with toe dorsiflexion
Achilles tendinopathy	<ul style="list-style-type: none"> Posterior pain Swelling & tenderness 2-6 cm proximal to tendon insertion
Calcaneal stress fracture	<ul style="list-style-type: none"> Pain that is worse with activity Pain reproduced by medial-lateral squeezing of the calcaneus
Tarsal tunnel syndrome	<ul style="list-style-type: none"> Pain, paresthesia & numbness on the sole of the foot Percussion tenderness over the posterior tibial nerve in the tarsal tunnel

Common causes of shoulder pain

Common causes of shoulder pain	
Rotator cuff impingement or tendinopathy	<ul style="list-style-type: none"> Pain with abduction, external rotation Subacromial tenderness Normal range of motion with positive impingement tests (eg, Neer, Hawkins)
Rotator cuff tear	<ul style="list-style-type: none"> Similar to rotator cuff tendinopathy Weakness with abduction & external rotation Age >40
Adhesive capsulitis (frozen shoulder)	<ul style="list-style-type: none"> Decreased passive & active range of motion Stiffness ± pain
Biceps tendinopathy or rupture	<ul style="list-style-type: none"> Anterior shoulder pain Pain with lifting, carrying, or overhead reaching Weakness (less common)
Glenohumeral osteoarthritis	<ul style="list-style-type: none"> Uncommon & usually caused by trauma Gradual onset of anterior or deep shoulder pain Decreased active & passive abduction & external rotation



Neuropathic arthropathy

Pathogenesis of neuropathic (Charcot) arthropathy



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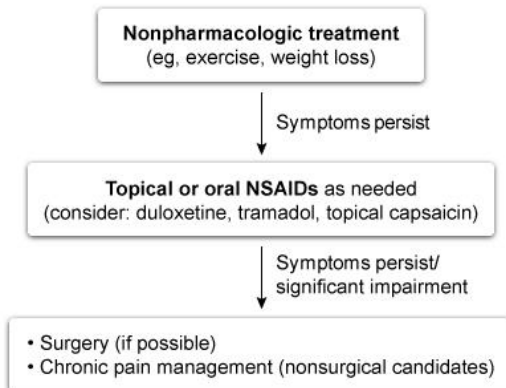
Ottawa ankle rules

Ottawa ankle rules	
X-ray of the ankle is required if: Pain at the <i>malleolar zone</i> and <ul style="list-style-type: none"> • Tender at posterior margin/tip of medial malleolus OR • Tender at posterior margin/tip of lateral malleolus OR • Unable to bear weight 4 steps (2 on each foot) 	Medial view Posterior margin or tip of medial malleolus 
X-ray of the foot is required if: Pain at the <i>midfoot zone</i> and <ul style="list-style-type: none"> • Tender at the navicular OR • Tender at the base of the 5th metatarsal OR • Unable to bear weight 4 steps (2 on each foot) 	Lateral view Posterior margin or tip of lateral malleolus Base of 5th metatarsal 

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Management of osteoarthritis

Management of osteoarthritis



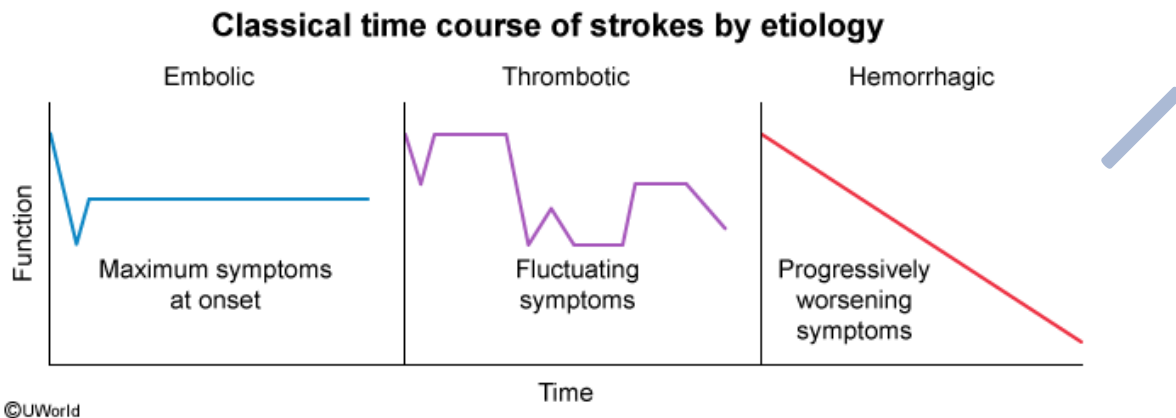
NSAIDs = nonsteroidal anti-inflammatory drugs.

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9. Neurology

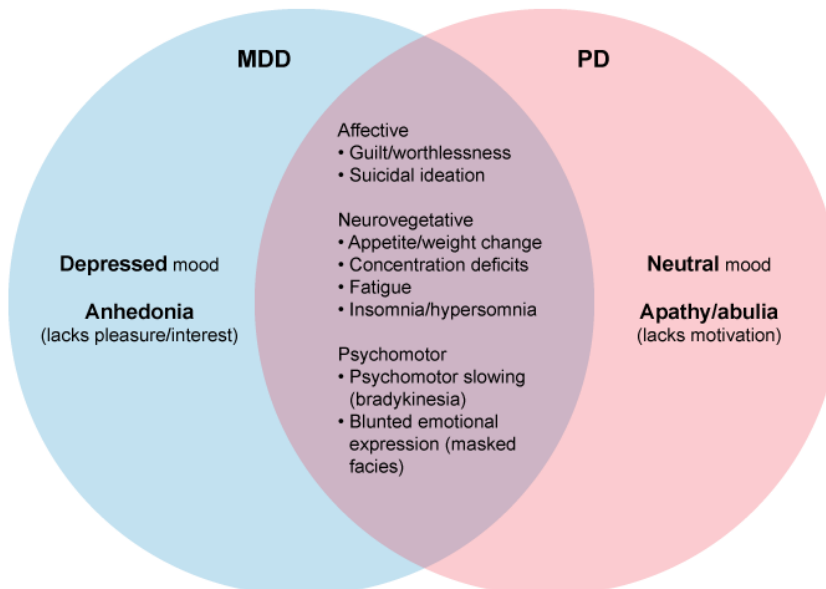
Medicine

Timeline of stroke



Parkinsons and MDD

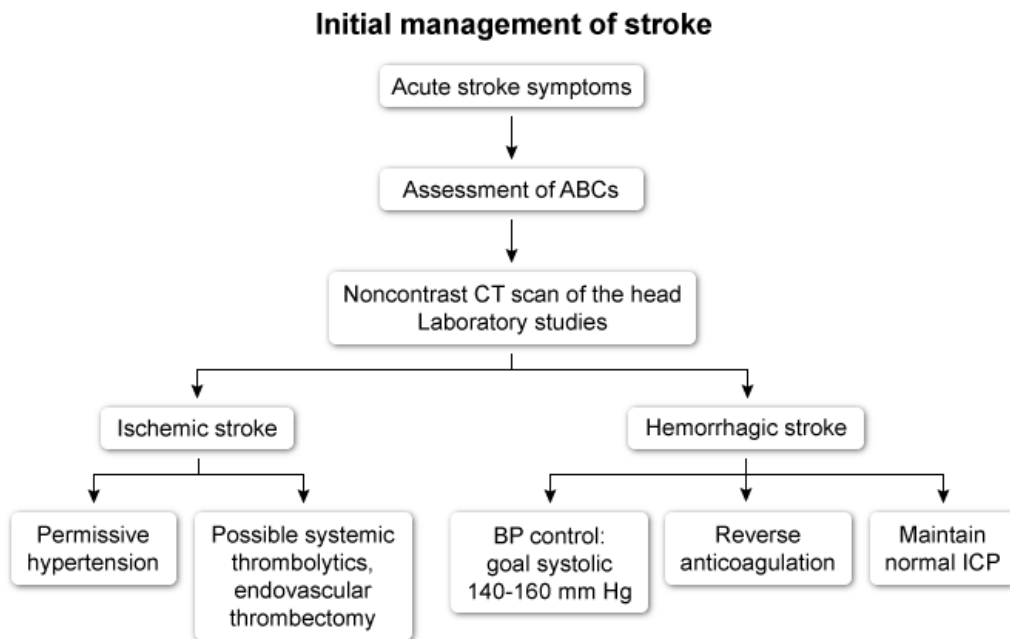
Major depressive disorder vs Parkinson disease symptoms



MDD = major depressive disorder; PD = Parkinson disease.

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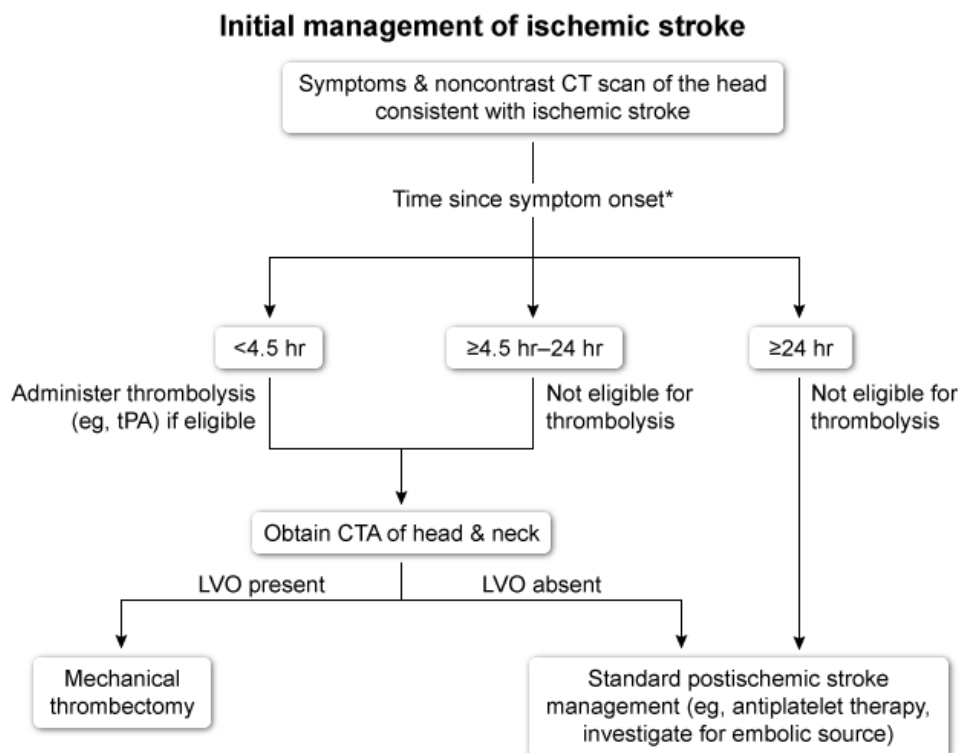
Initial management of stroke



BP = blood pressure; ICP = intracranial pressure.

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Management of ischemic stroke



*Or since last observed at neurologic baseline.

CTA = CT angiography; LVO = large vessel occlusion; tPA = tissue plasminogen activator.

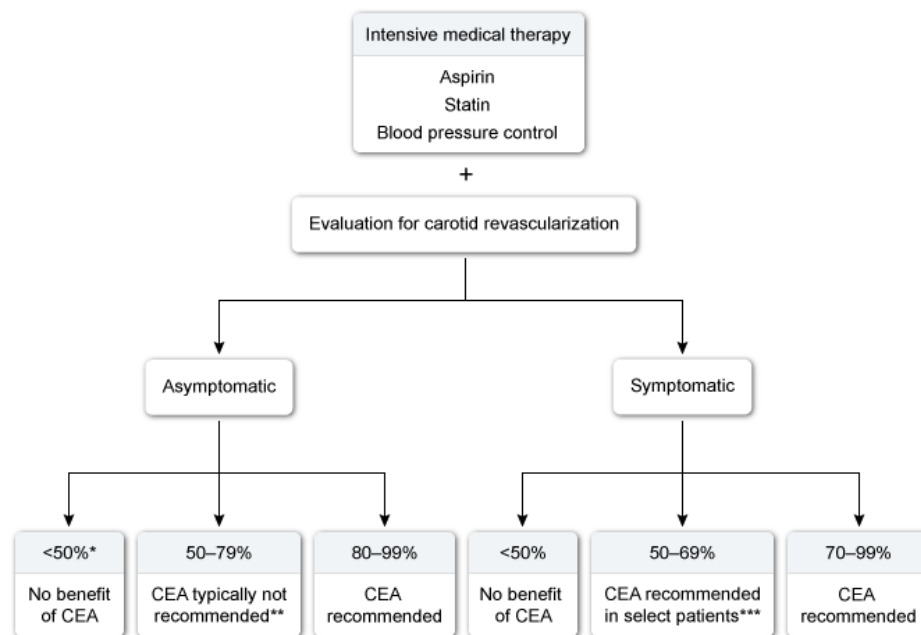
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Gait disorders

Gait disorders			
Type of gait	Description	Associated signs	Causes
Cerebellar	Ataxic: Staggering, wide-based	Dysdiadochokinesia, dysmetria, nystagmus, Romberg sign	<ul style="list-style-type: none"> • Cerebellar degeneration • Stroke • Drug/alcohol intoxication • Vitamin B₁₂ deficiency
Gait apraxia (frontal gait)	Magnetic (freezing): Start & turn hesitation	Dementia, incontinence, frontal lobe signs	<ul style="list-style-type: none"> • Frontal lobe degeneration • Normal pressure hydrocephalus
Parkinsonian	Short steps, shuffling	Bradykinesia, resting tremor, postural instability, decreased arm swing	<ul style="list-style-type: none"> • Parkinson disease
Steppage	Footdrop, excessive hip & knee flexion while walking, slapping quality, falls	Distal sensory loss & weakness	<ul style="list-style-type: none"> • Motor neuropathy
Vestibular	Unsteady, falling to one side	Normal sensation, reflexes & motor strength; nausea, vertigo	<ul style="list-style-type: none"> • Acute labyrinthitis • Ménière disease

Management of carotid atherosclerotic disease

Management of carotid atherosclerotic disease



*Degree of stenosis.

**May be recommended in select patients with low perioperative risk (eg, <3%).

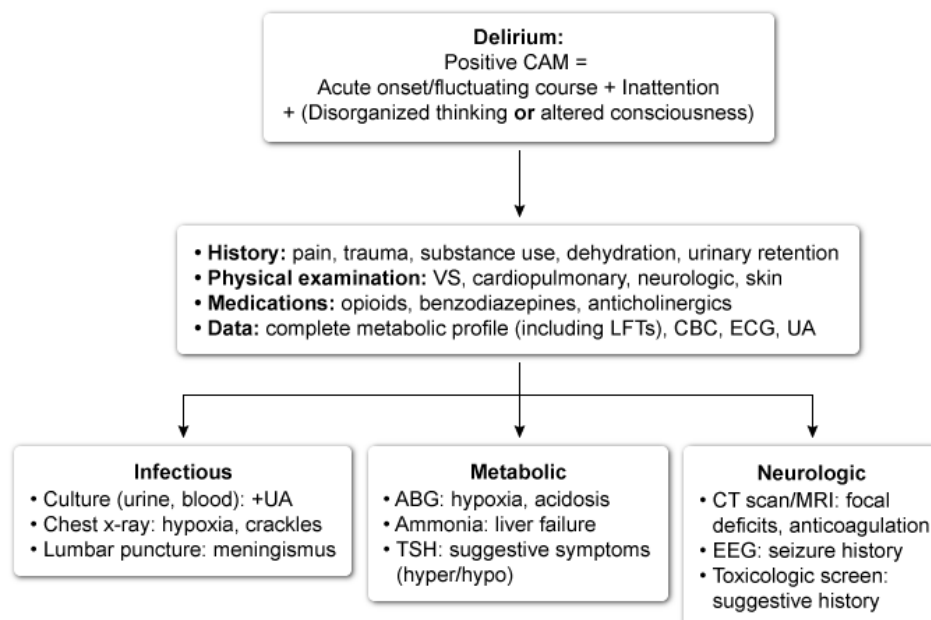
***Men likely benefit from CEA, whereas women likely benefit from intensive medical therapy only.

CEA = carotid endarterectomy; TIA = transient ischemic attack.

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Assessment of delirium

Evaluation of delirium

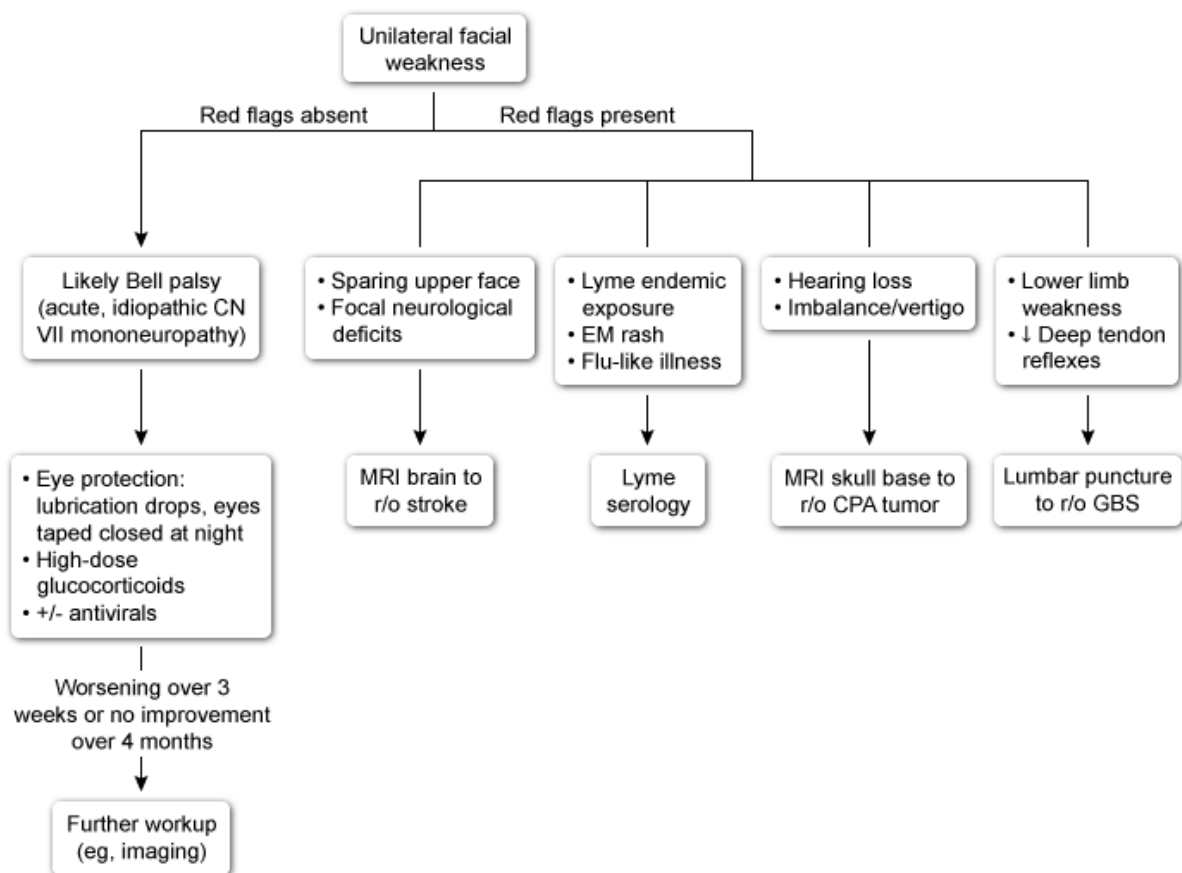


ABG = arterial blood gas; CAM = Confusion Assessment Method; CBC = complete blood count; EEG = electroencephalogram; LFT = liver function test; UA = urinalysis; VS = vital signs.

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Bells palsy

Management of unilateral facial weakness



EM = erythema migrans; CPA = cerebellopontine angle; GBS = Guillain-Barré syndrome.

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Management of hospital delirium

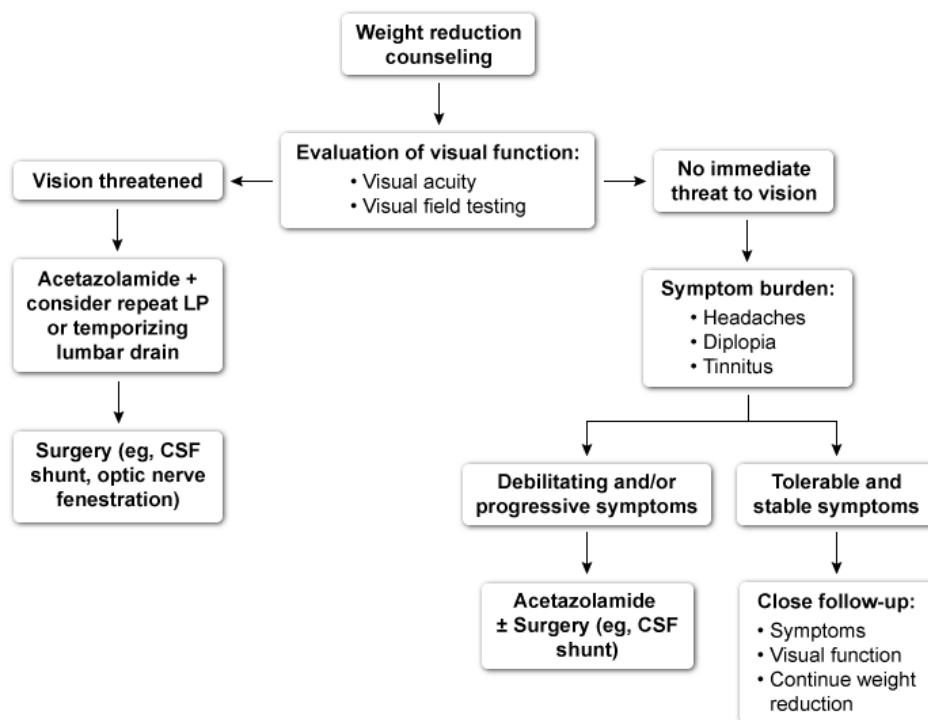
Management of hospital delirium

- **Reduce noise, improve room lighting, open window blinds during the day & avoid frequent room changes**
- Constant observation by a familiar person at the bedside, preferably a family member
- Nonpharmacologic sleep aids for insomnia
- Early mobilization & minimal use of physical restraints
- Visual & hearing aids when appropriate
- Early volume repletion for dehydrated patients
- Adequate pain control
- Aggressive chronic disease management (eg, diabetes, COPD)
- **Reduce polypharmacy**
- Monitor & treat for metabolic disturbances, infections & drug toxicity

COPD = chronic obstructive pulmonary disease.

Idiopathic Intracranial HTN

Management of idiopathic intracranial hypertension



CSF = cerebrospinal fluid; LP = lumbar puncture.

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Antipsychotics adverse effects

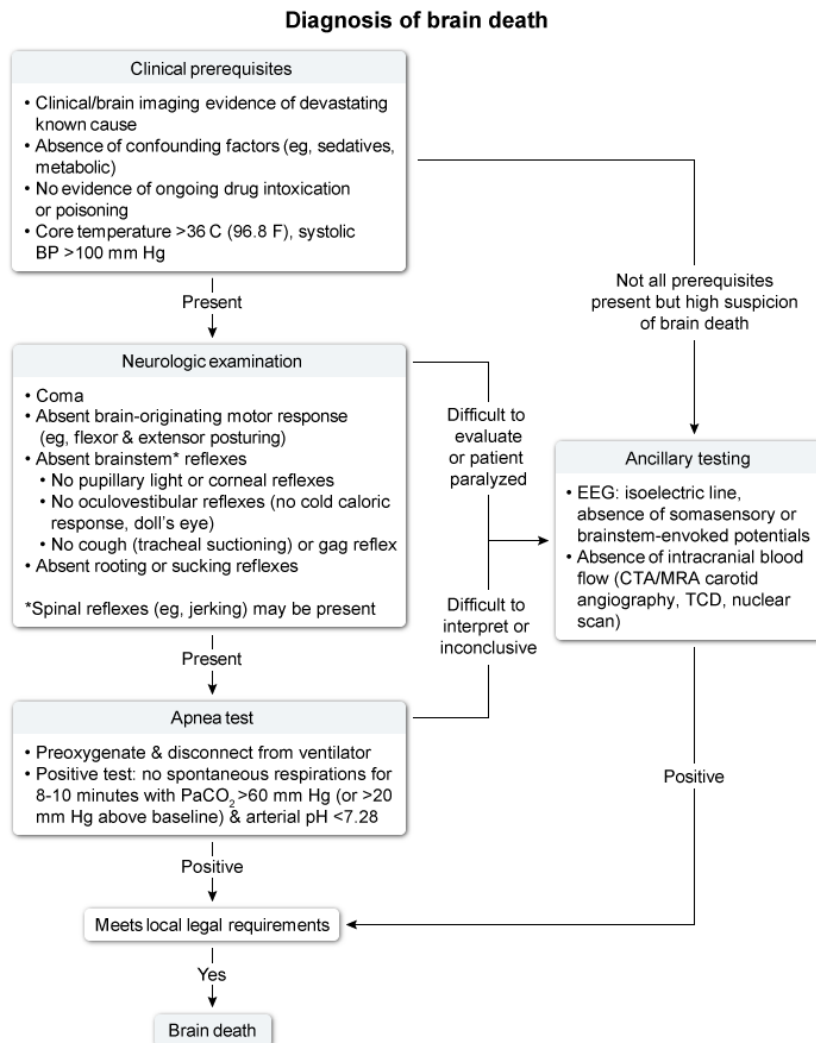
Antipsychotic extrapyramidal effects		Pharmacotherapy*
Acute dystonia	<ul style="list-style-type: none"> Sudden, sustained contraction of the neck, mouth, tongue & eye muscles 	<ul style="list-style-type: none"> Benztropine Diphenhydramine
Akathisia	<ul style="list-style-type: none"> Subjective restlessness, inability to sit still 	<ul style="list-style-type: none"> Beta blocker (propranolol) Benzodiazepine (lorazepam) Benzotropine
Parkinsonism	<ul style="list-style-type: none"> Gradual-onset tremor, rigidity & bradykinesia 	<ul style="list-style-type: none"> Benzotropine Amantadine
Tardive dyskinesia	<ul style="list-style-type: none"> Gradual onset after prolonged therapy (>6 months): dyskinesia of the mouth, face, trunk & extremities 	<ul style="list-style-type: none"> Valbenazine Deutetrabenazine

***Management may include reducing the dose or switching to another antipsychotic, depending on the clinical scenario.**

Initial workup of cognitive decline

Initial workup of suspected cognitive impairment	
Cognitive testing	<ul style="list-style-type: none">• MMSE (score <24/30 suggestive of MCI/dementia)• Montreal Cognitive Assessment (score <26/30)• Mini-Cog (abnormal 3-word recall &/or clock-drawing test)
Laboratory testing	<ul style="list-style-type: none">• Routine: CBC, vitamin B₁₂, TSH, CMP• Selective (specific risk factors): folate, syphilis, vitamin D level• Atypical (early onset): CSF
Imaging	<ul style="list-style-type: none">• Routine: CT scan or MRI of the brain• Atypical: EEG
CBC = complete blood count; CMP = complete metabolic panel; CSF = cerebrospinal fluid; EEG = electroencephalogram; MCI = mild cognitive impairment; MMSE = Mini-Mental State Examination.	

Brain death diagnosis

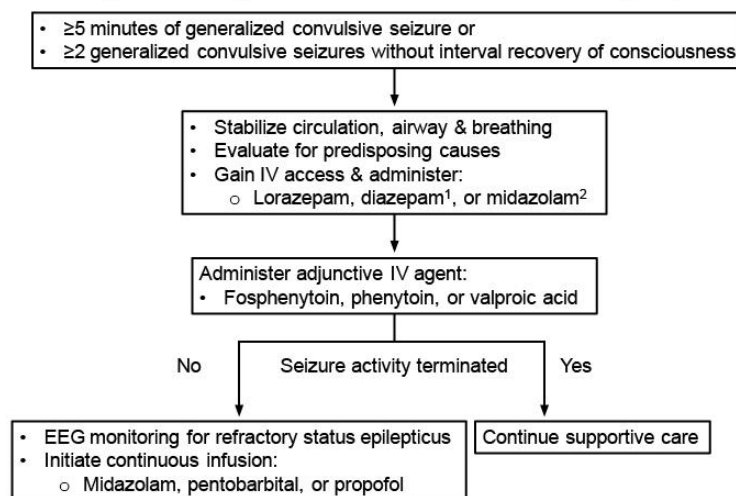


CTA = computed tomographic angiography; EEG = electroencephalogram; MRA = magnetic resonance angiography; TCD = transcranial doppler.

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Management of generalized convulsive status epilepticus

Management of generalized convulsive status epilepticus



¹May also be administered per rectum.

²May also be administered intramuscularly.

IV = intravenous; EEG = electroencephalogram.

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CSF analysis

Cerebrospinal fluid analysis			
Diagnosis	WBC count (mm ³)	Glucose (mg/dL)	Protein (mg/dL)
Normal	0-5	40-70	<40
Bacterial meningitis	>1,000	<40	>250
Tuberculous meningitis	100-500	<45	100-500
Viral meningitis	10-500	40-70	<150
Guillain-Barré syndrome	0-5	40-70	45-1,000

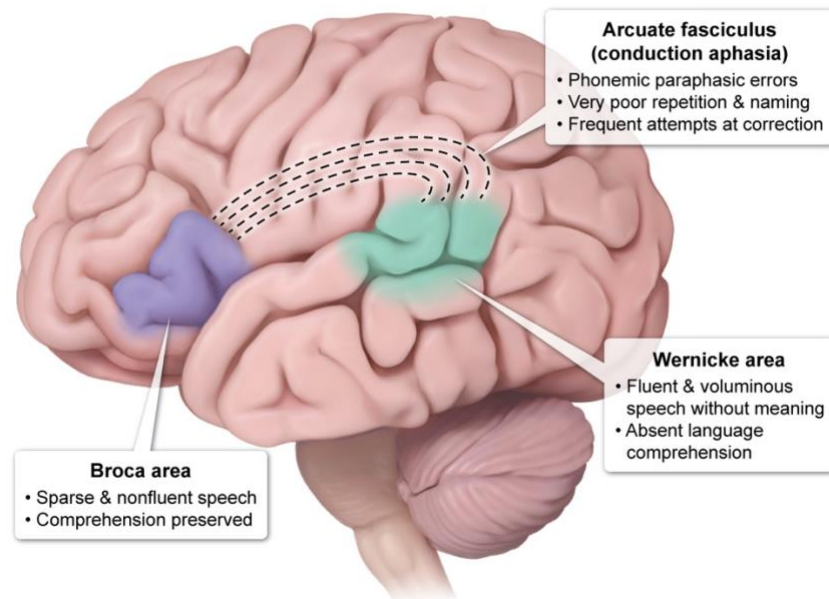
WBC = white blood cell.

Indications of dialysis

Indications for urgent dialysis (AEIOU)	
<u>A</u> cidosis	<ul style="list-style-type: none"> Metabolic acidosis <ul style="list-style-type: none"> pH <7.1 refractory to medical therapy
<u>E</u> lectrolyte abnormalities	<ul style="list-style-type: none"> Symptomatic hyperkalemia <ul style="list-style-type: none"> ECG changes or ventricular arrhythmias Severe hyperkalemia <ul style="list-style-type: none"> Potassium >6.5 mEq/L refractory to medical therapy
<u>I</u> ngestion	<ul style="list-style-type: none"> Toxic alcohols (methanol, ethylene glycol) Salicylate Lithium Sodium valproate, carbamazepine
<u>O</u> verload	<ul style="list-style-type: none"> Volume overload refractory to diuretics
<u>U</u> remia	<ul style="list-style-type: none"> Symptomatic: <ul style="list-style-type: none"> Encephalopathy Pericarditis Bleeding

Aphasia

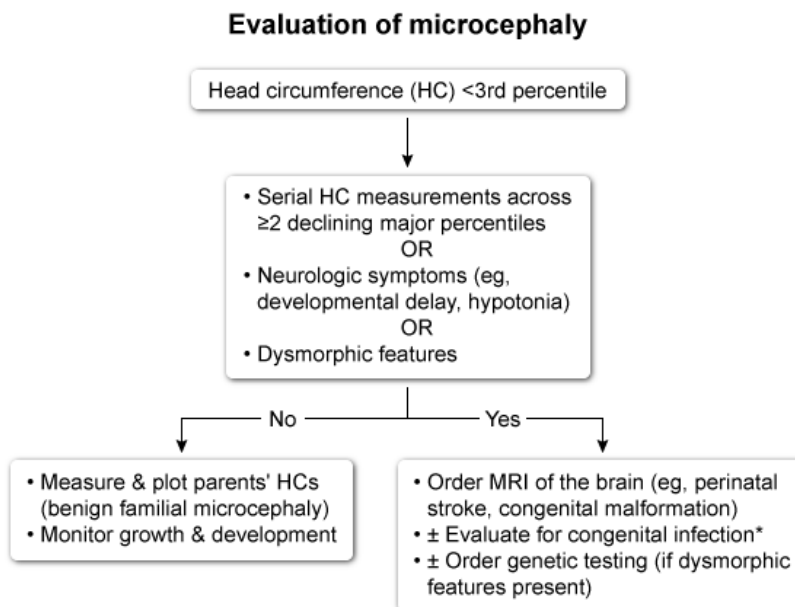
Common types of aphasia



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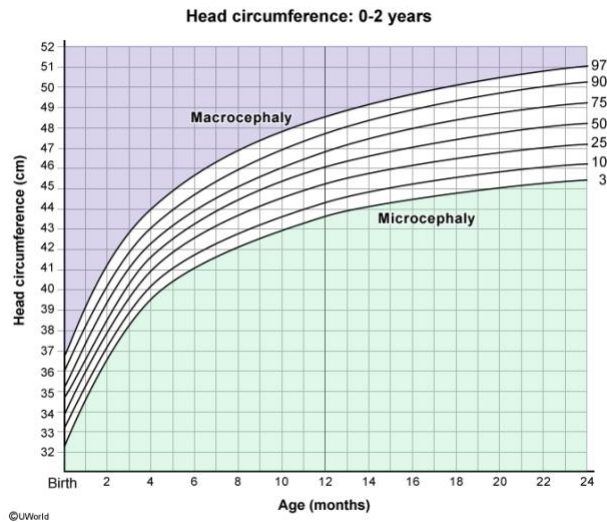
Pediatrics

Microcephaly evaluation



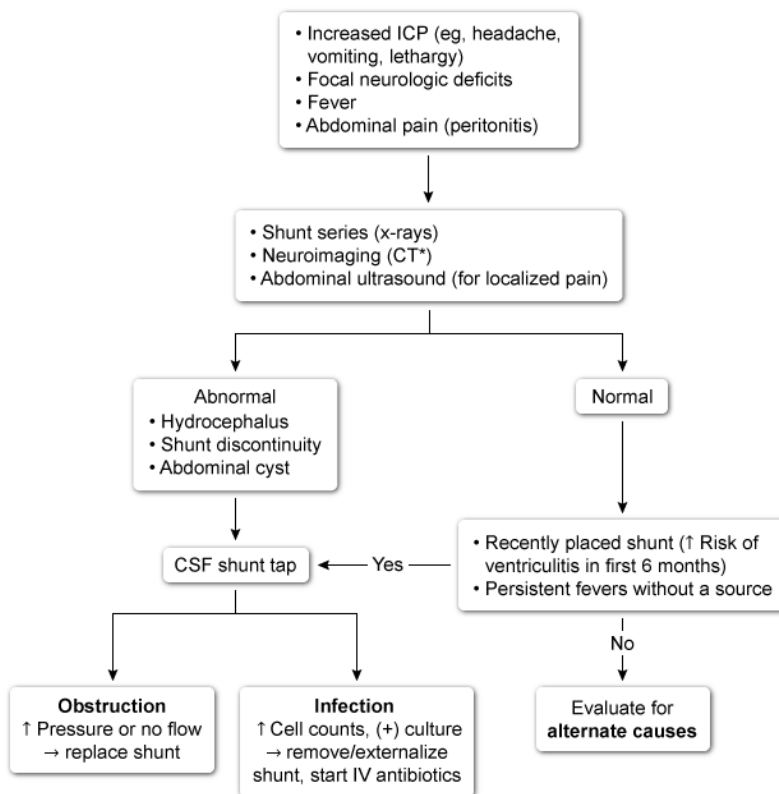
*For microcephaly onset at birth with symmetric growth restriction, systemic features (eg, hepatosplenomegaly), hearing loss, or risk factors (eg, maternal infection).

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Complications of ventriculoperitoneal shunt

Approach to suspected ventriculoperitoneal shunt complications



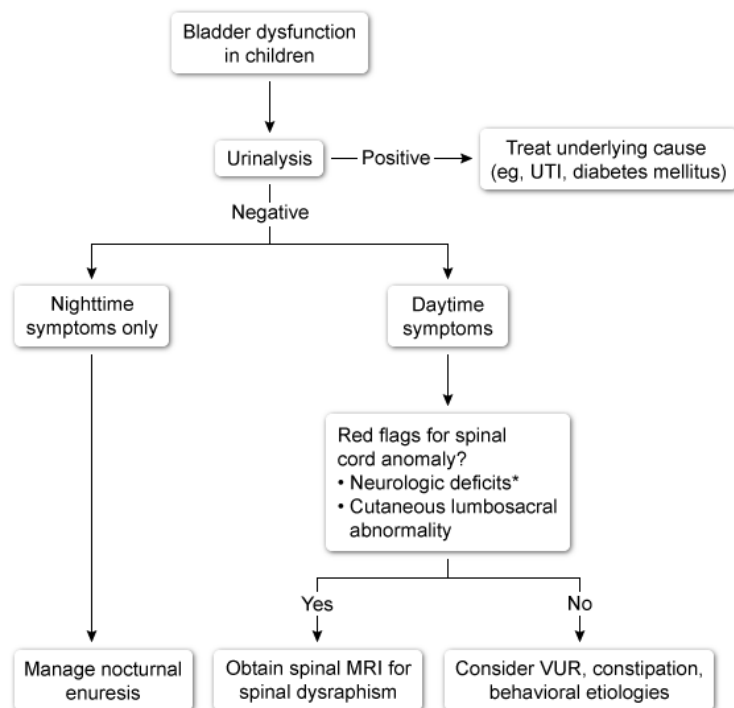
*May use ultrasound if fontanelle open.

CSF = cerebrospinal fluid; ICP = intracranial pressure; IV = intravenous.

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Bladder dysfunction in children

Evaluation of bladder dysfunction in children



UTI = urinary tract infection; VUR = vesicoureteral reflux.
*Lower extremity weakness, hypotonia, hyporeflexia.

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10. Infectious diseases

Vaccine for adults

Vaccines for adults with HIV	
Vaccine	Indications
HAV	<ul style="list-style-type: none"> All patients without documented immunity to HAV
HBV	<ul style="list-style-type: none"> All patients without documented immunity to HBV
HPV	<ul style="list-style-type: none"> All patients age 11-26
Influenza	<ul style="list-style-type: none"> Inactivated vaccine annually
<i>Meningococcus</i> (serogroups A, C, W, Y)	<ul style="list-style-type: none"> All patients
<i>Pneumococcus</i>	<ul style="list-style-type: none"> Pneumococcal conjugate vaccine once Pneumococcal polysaccharide vaccine 8 weeks later, 5 years later & at age 65
Varicella-zoster	<ul style="list-style-type: none"> Varicella (live): patients born after 1979 without evidence of immunity* Recombinant zoster: all patients age ≥ 50
<p>*Live vaccines (eg, MMR, varicella) contraindicated if CD4 $< 200/\text{mm}^3$.</p> <p>HAV = hepatitis A virus; HBV = hepatitis B virus; HPV = human papillomavirus; MMR = measles, mumps & rubella.</p>	

Immunization in HIV patients

Opportunistic infections in HIV		
Infection	CD4 cell count	Prophylaxis
<i>Pneumocystis jirovecii</i>	<ul style="list-style-type: none"> $< 200/\text{mm}^3$ OR Oropharyngeal candidiasis OR History of PCP infection 	<p>Trimethoprim-sulfamethoxazole</p> <p>Alternate therapies:</p> <ul style="list-style-type: none"> Dapsone Atovaquone Pentamidine
<i>Toxoplasma gondii</i>	$< 100/\text{mm}^3$ & positive IgG antibody	Trimethoprim-sulfamethoxazole

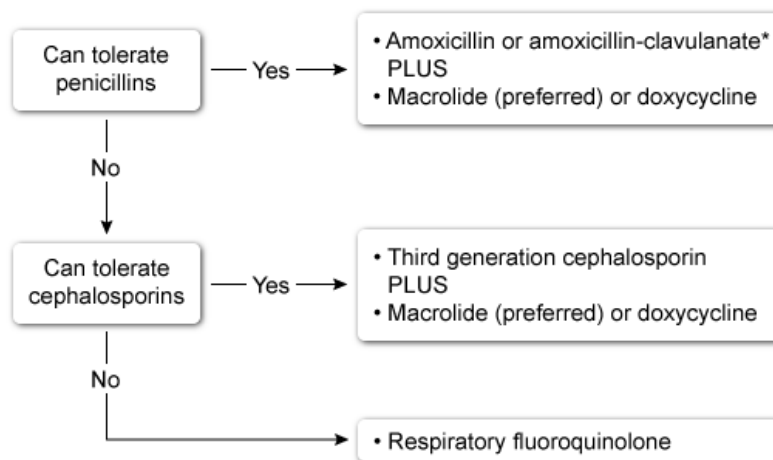
		Alternate therapies: <ul style="list-style-type: none"> Dapsone plus pyrimethamine plus leucovorin Atovaquone ± pyrimethamine plus leucovorin
<i>Histoplasma capsulatum</i>	<150/mm ³ & endemic area	Itraconazole
VZV	Close contact with person with chickenpox or shingles & no history of prior disease or negative antibody to VZV	VariZIG or IVIG administered within 4 days of exposure
IVIG = intravenous immune globulin; PCP = <i>Pneumocystis jirovecii</i> pneumonia; VariZIG = human varicella immune globulin; VZV = varicella-zoster virus.		

Screening for STIs

Sexually transmitted infection screening*	
All patients	<ul style="list-style-type: none"> <i>Neisseria gonorrhoeae</i> (eg, NAAT) <i>Chlamydia trachomatis</i> (eg, NAAT) Syphilis (eg, RPR) HIV (eg, 4th-generation antigen/antibody)
Additional testing for certain populations	<ul style="list-style-type: none"> Women only: <i>Trichomonas vaginalis</i> (eg, wet mount) Herpes simplex virus screening (eg, serology) only when history of characteristic lesions
*For patients with active sexually transmitted infection or those who request screening.	
NAAT = nucleic acid amplification testing; RPR = rapid plasma reagin.	

Treatment of CAP

Outpatient treatment of community-acquired pneumonia



*Use amoxicillin-clavulanate when risk factors for severe disease are present (eg, smoking, age >65, recent antibiotics, major comorbidities, alcohol use disorder).

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CDC immunization schedule

CDC immunization schedule

Birth	1	2	4	6	12	15	18	19-23	2	4-6	11-12	16
	Months								Years			
Hep B #1	Hep B #2			Hep B #3								
	RV #1	RV #2	RV* #3									
	DTaP #1	DTaP #2	DTaP #3		DTaP #4				DTaP #5			
	Hib #1	Hib #2	Hib #3	Hib #4								
	PCV #1	PCV #2	PCV #3	PCV #4								
	IPV #1	IPV #2		IPV #3					IPV #4			
					Hep A #1 & 3							
					MMR #1				MMR #2			
					VZV #1				VZV #2			
											Tdap #1	
											HPV** #1,2	
											MCV #1	MCV #2
					Inactivated influenza annually							
												MenB #1,2

Hep B = Hepatitis B
 RV* = Rotavirus (2 doses if Rotarix is used, 3 doses if RotaTeq is used)
 DTaP = Diphtheria, tetanus toxoids, acellular pertussis
 Tdap = Tetanus toxoid, reduced diphtheria toxoid, acellular pertussis
 Hib = *Haemophilus influenzae* type b conjugate vaccine
 PCV = Pneumococcal conjugate vaccine
 MenB = Meningococcal serogroup B

IPV = Inactivated poliovirus
 MMR = Measles, mumps & rubella
 VZV = Varicella-zoster virus
 Hep A = Hepatitis A
 MCV = Meningococcal conjugate vaccine
 HPV** = Human papillomavirus, 3 doses if initiated age >15

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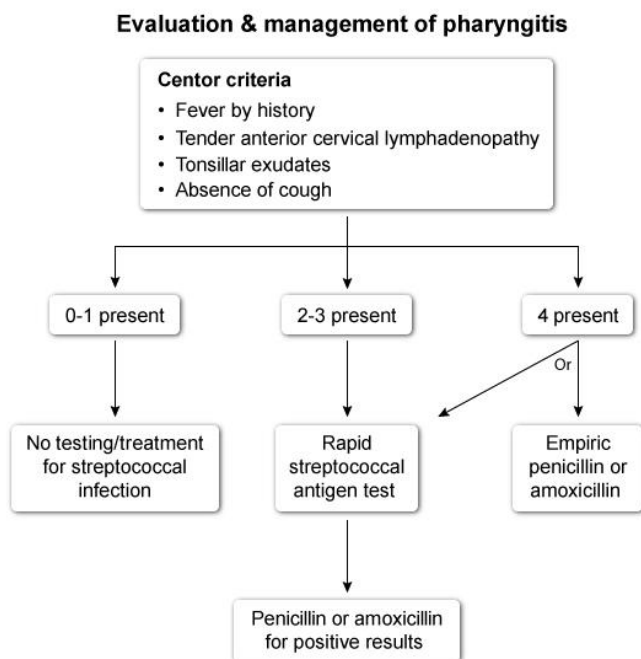
Influenza vaccination and treatment

Distinguishing features of common upper respiratory illnesses			
	Viral upper respiratory syndrome	<u>Influenza</u>	Streptococcal pharyngitis
Onset of symptoms	Slow, stepwise, migratory, or evolving	<u>Abrupt & often dramatic</u>	Variable
Upper respiratory symptoms	Rhinorrhea, coryza, sneezing, mild pharyngitis	<u>Usually mild</u>	Predominantly pharyngeal symptoms
Systemic symptoms	Usually mild	<u>Prominent with possible high fever, myalgias, headache</u>	Variable with possible fever & myalgias
Examination findings	Nasal edema with normal or slightly erythematous pharynx	<u>Variable but often unremarkable</u>	Pharyngeal erythema, tonsillar hypertrophy & exudates, tender cervical lymph nodes

Diarrhea in AIDS patients

Common causes of diarrhea in patients with AIDS		
Organism	CD4 count	Symptoms
<i>Cryptosporidium</i>	<180/mm ³	<ul style="list-style-type: none"> Severe watery diarrhea Low-grade fever Weight loss
<i>Microsporidium/Isosporidium</i>	<100/mm ³	<ul style="list-style-type: none"> Watery diarrhea Crampy abdominal pain Weight loss Fever is rare
<i>Mycobacterium avium</i> complex	<50/mm ³	<ul style="list-style-type: none"> Watery diarrhea High fever (>39 C [102.2 F]) Weight loss
Cytomegalovirus	<50/mm ³	<ul style="list-style-type: none"> Frequent, small-volume diarrhea Hematochezia Abdominal pain Low-grade fever Weight loss

Evaluation of pharyngitis

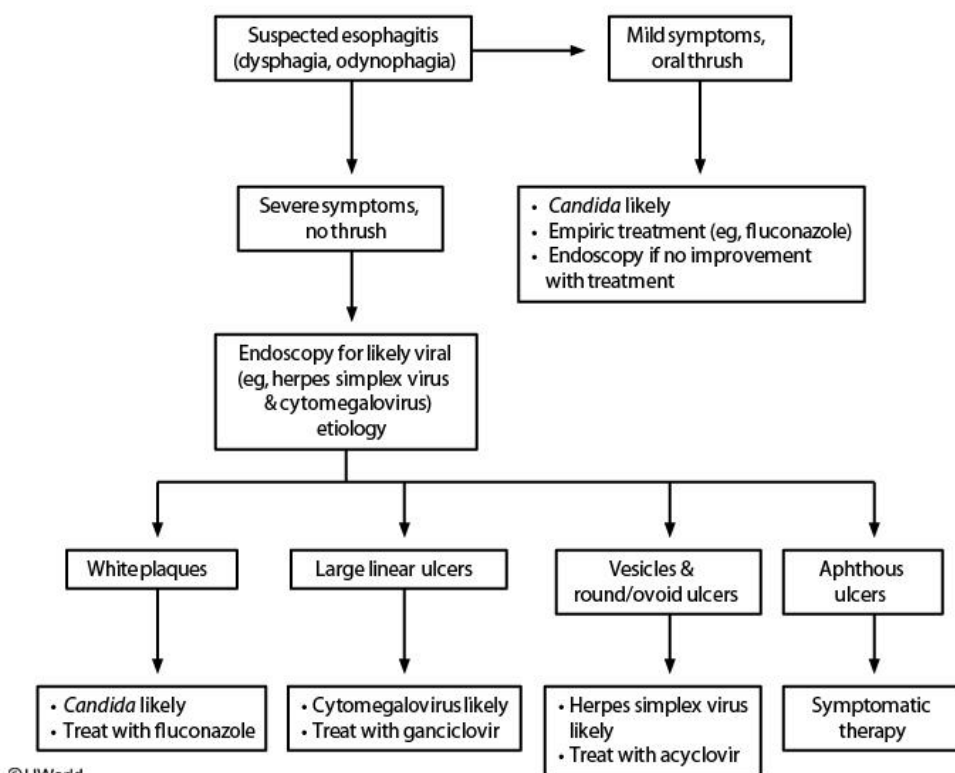


Bacterial meningitis

Bacterial meningitis		
Risk group	Common organisms	Empiric antibiotics
Age 2-50	<i>Streptococcus pneumoniae</i> , <i>Neisseria meningitidis</i>	Vancomycin + 3rd-generation cephalosporin
Age >50	<i>S pneumoniae</i> , <i>N meningitidis</i> , <i>Listeria</i>	Vancomycin + ampicillin + 3rd-generation cephalosporin
Immunocompromised	<i>S pneumoniae</i> , <i>N meningitidis</i> , <i>Listeria</i> , gram-negative rods	Vancomycin + ampicillin + cefepime
Neurosurgery/penetrating skull trauma	Gram-negative rods, MRSA, coagulase-negative staphylococci	Vancomycin + cefepime
<ul style="list-style-type: none"> 3rd-generation cephalosporins: ceftriaxone or cefotaxime Alternatives to cefepime: ceftazidime or meropenem Alternative to ampicillin: trimethoprim-sulfamethoxazole for <i>Listeria</i> 		
MRSA = methicillin-resistant <i>Staphylococcus aureus</i> .		

Dysphagia in AIDS

Approach to odynophagia & dysphagia in patients with HIV



Treatment of syphilis

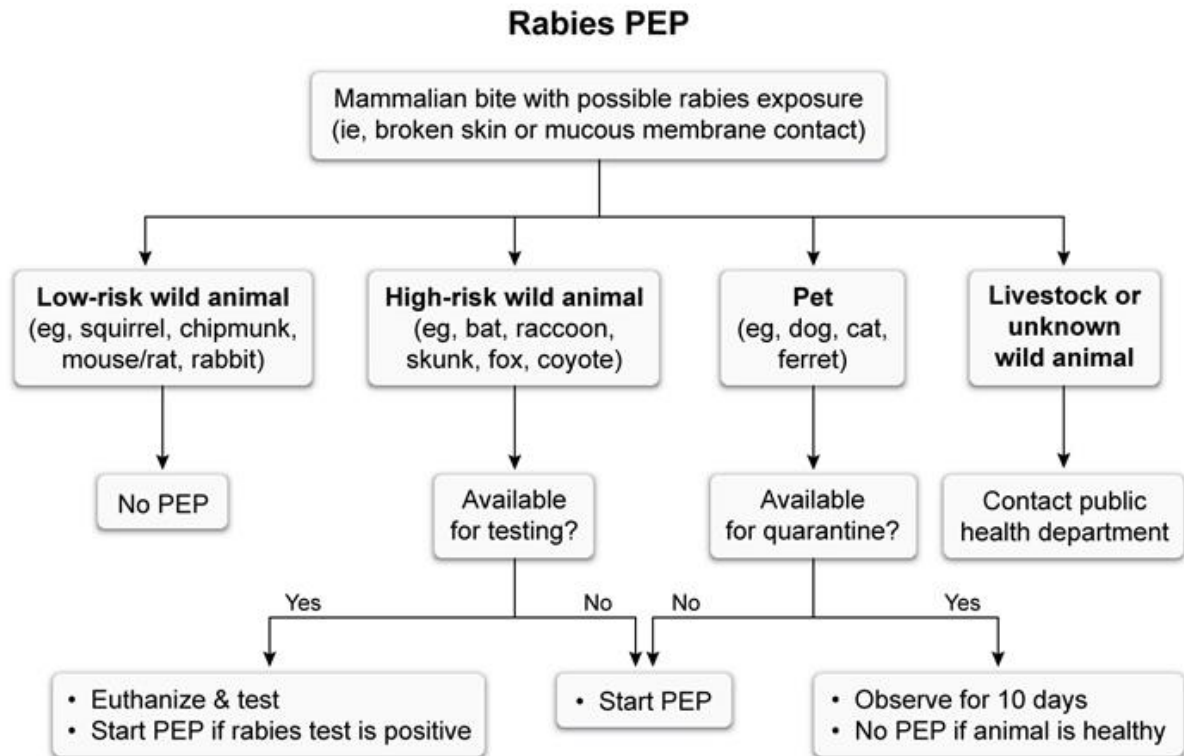
Syphilis treatment		
Stage	First line	Alternate
Primary (chancre)	Penicillin G IM × 1	Doxycycline × 14 days
Secondary (diffuse rash)		
Early latent (asymptomatic)*		
Late latent (asymptomatic)*	Penicillin G IM × 3	Doxycycline × 28 days
Tertiary (eg, CV, gummata)		
Neurosyphilis (eg, meningitis, ocular)	Penicillin G IV × 10-14 days	Ceftriaxone IV × 14 days**

*Early latent = asymptomatic with infection <1 year; Late latent = asymptomatic with unknown duration of infection or infection >1 year.

**Penicillin desensitization followed by IV penicillin is preferred for those with penicillin allergy who have neurosyphilis; ceftriaxone can be used in those unable to be desensitized.

CV = cardiovascular; IM = intramuscular; IV = intravenous.

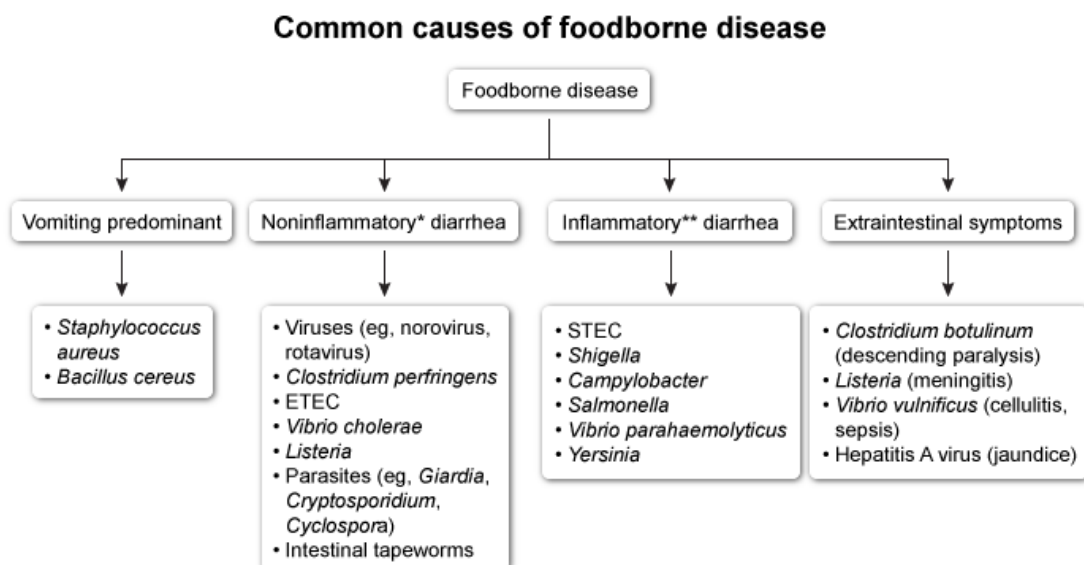
PEP in animal bite



PEP = postexposure prophylaxis.

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Foodborne illness



*Watery stools are typical.

**Bloody/mucoid stools or positive fecal leukocytes &/or red blood cells.

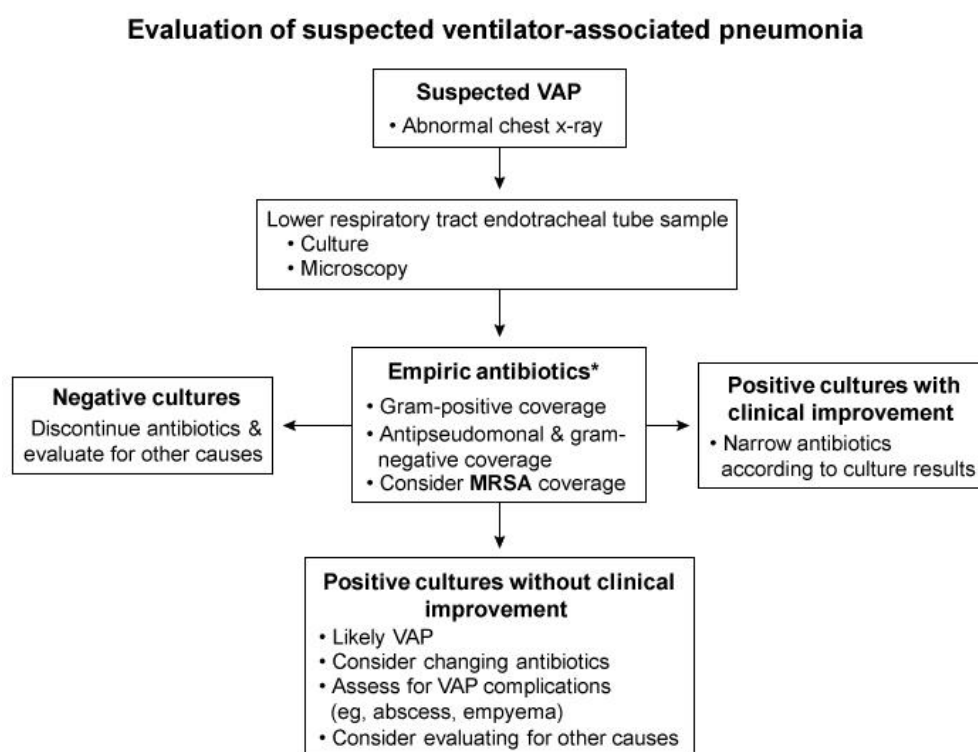
ETEC = enterotoxigenic *Escherichia coli*; STEC = Shiga toxin-producing *E. coli*.

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Airborne precautions

Airborne precautions	
Indications	<ul style="list-style-type: none"> • Tuberculosis • Varicella* (chickenpox) • Herpes zoster** (shingles) • Rubella (measles)
Components	<ul style="list-style-type: none"> • N95 respirator or powered air-purifying respirator • Negative-pressure isolation room with high-efficiency particulate air filter • As needed if contact with body fluid is anticipated: clean gloves, disposable gown, goggles/face shield
<p>*Only when uncrusted lesions are present; contact precautions also required.</p> <p>**Only in disseminated disease or immunocompromised clients; contact precautions also required.</p>	

Evaluation of suspected ventilator associated pneumonia



MRSA = methicillin-resistant *Staphylococcus aureus*; VAP = ventilator-associated pneumonia.

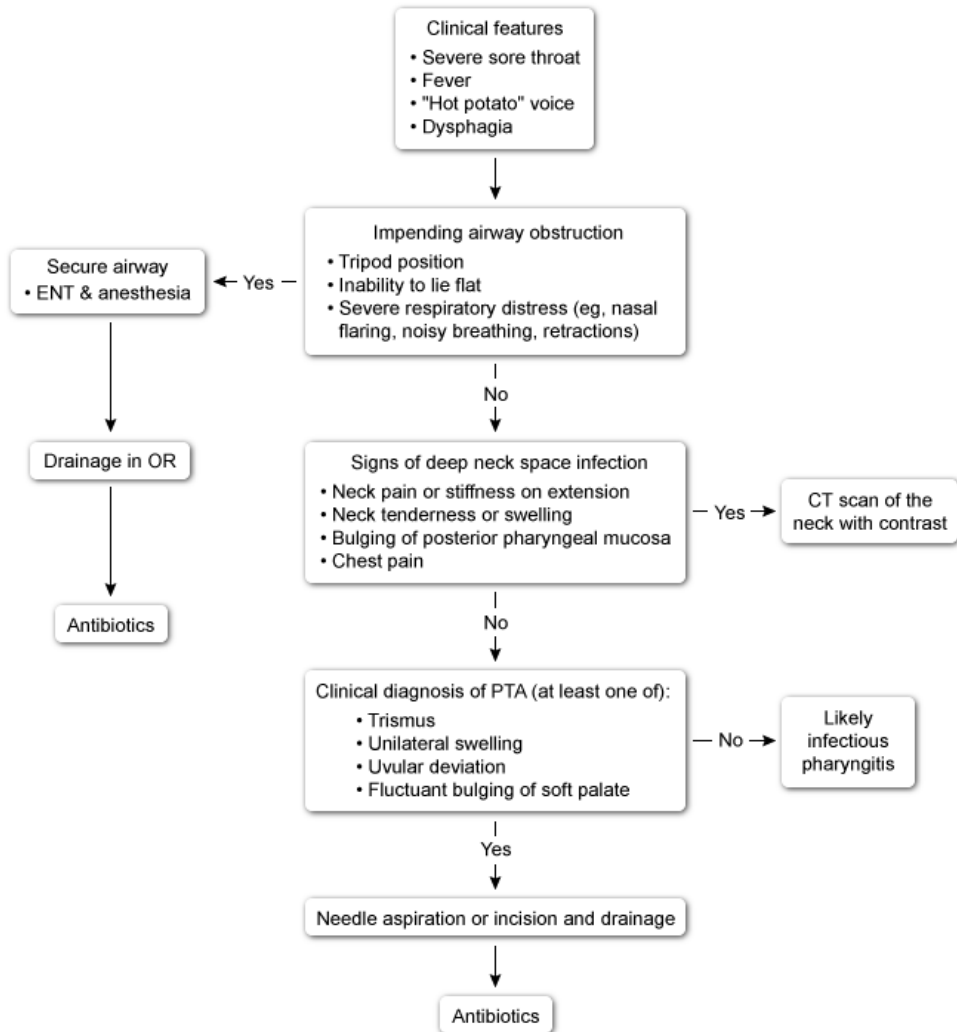
*Empiric coverage depends on drug-resistance pattern at institution.

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11. ENT

Management of peritonsillar abscess

Management of suspected peritonsillar abscess

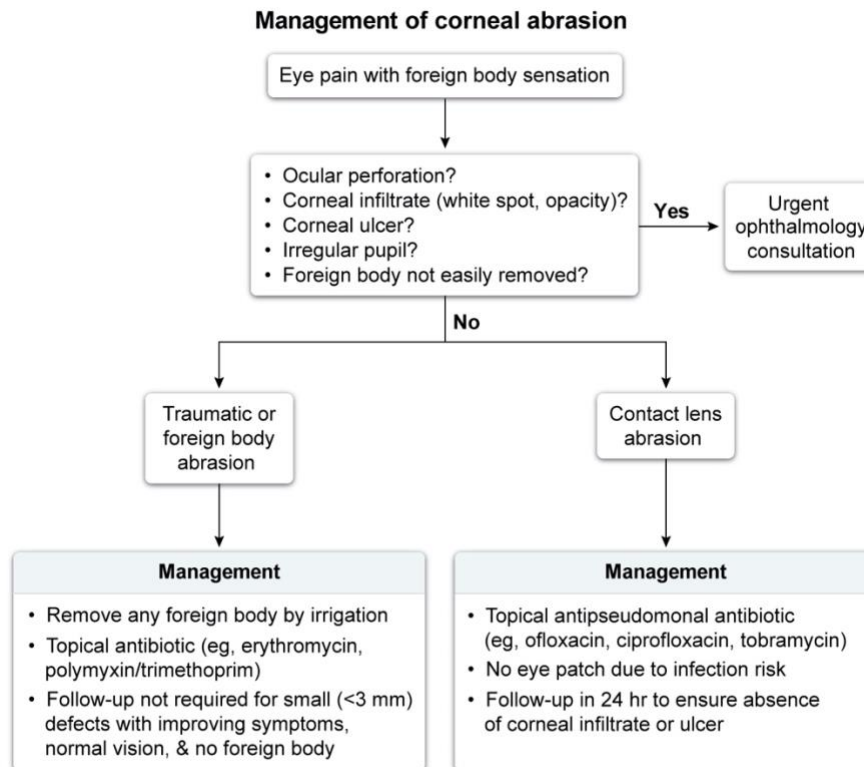


ENT = ear, nose, throat; OR = operating room; PTA = peritonsillar abscess.

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12. Ophthalmology

Management of corneal abrasion



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13. Dermatology

Childhood vascular lesions

Common vascular lesions in childhood

Nevus flammeus
(port-wine stain)



- Red to purple patches that do not regress
- Respect midline

Nevus simplex



- Blanching pink patches that fade with time
- Usually located on eyelids, glabella, and nape of neck

Hemangioma



- Bright red raised plaque
- Undergoes proliferation followed by involution

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Treatment of acne vulgaris

Treatment of acne vulgaris

	<p>Comedonal acne</p> <ul style="list-style-type: none"> • Closed or open comedones on forehead, nose & chin • May progress to inflammatory pustules or nodules • Treatment: Topical retinoids; salicylic, azelaic, or glycolic acid
	<p>Inflammatory acne</p> <ul style="list-style-type: none"> • Inflamed papules (<5 mm) & pustules; erythema • Treatment: <ul style="list-style-type: none"> ◦ Mild: Topical retinoids + benzoyl peroxide ◦ Moderate: Add topical antibiotics (eg, clindamycin, erythromycin) ◦ Severe: Add oral antibiotics
	<p>Nodular (cystic) acne</p> <ul style="list-style-type: none"> • Large (>5 mm) nodules that can appear cystic • Nodules may merge to form sinus tracts with possible scarring • Treatment: <ul style="list-style-type: none"> ◦ Moderate: Topical retinoid + benzoyl peroxide + topical antibiotics ◦ Severe: Add oral antibiotics ◦ Unresponsive severe: Oral isotretinoin

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Benign childhood rashes

Benign neonatal rashes			
Diagnosis	Onset	Clinical features	Management/resolution
Erythema toxicum neonatorum	<ul style="list-style-type: none"> Birth to age 3 days 	<ul style="list-style-type: none"> Pustules with erythematous base on trunk & proximal extremities 	<ul style="list-style-type: none"> Observation Resolves within a week
Milia	<ul style="list-style-type: none"> Birth 	<ul style="list-style-type: none"> Firm, white papules on face 	<ul style="list-style-type: none"> Observation Resolves within a month
Miliaria rubra	<ul style="list-style-type: none"> Any age, but not present at birth 	<ul style="list-style-type: none"> Erythematous, papular rash on occluded & intertriginous areas 	<ul style="list-style-type: none"> Avoid overheating (eg, cool environment, thin/cotton clothing) If severe, topical corticosteroid
Neonatal pustular melanosis	<ul style="list-style-type: none"> Birth 	<ul style="list-style-type: none"> Nonerythematous pustules → evolve into hyperpigmented macules with collarette of scale Diffuse, may involve palms & soles 	<ul style="list-style-type: none"> Observation Pustules resolve within days Hyperpigmentation may last months
Neonatal cephalic pustulosis	<ul style="list-style-type: none"> Around age 3 weeks 	<ul style="list-style-type: none"> Erythematous papules & pustules on face & scalp only 	<ul style="list-style-type: none"> Observation Resolves in weeks to months If severe, topical corticosteroid or ketoconazole

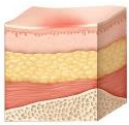
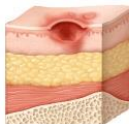
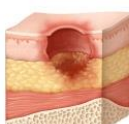
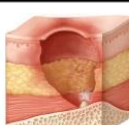
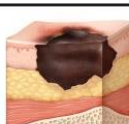
Skin conditions and associated diseases

Skin conditions & associated diseases	
Skin conditions	Associated conditions
<ul style="list-style-type: none"> Acanthosis nigricans 	<ul style="list-style-type: none"> Insulin resistance

	<ul style="list-style-type: none"> Gastrointestinal malignancy
<ul style="list-style-type: none"> Multiple skin tags 	<ul style="list-style-type: none"> Insulin resistance Pregnancy Crohn disease (perianal)
<ul style="list-style-type: none"> Porphyria cutanea tarda Cutaneous leukocytoclastic vasculitis (palpable purpura) secondary to cryoglobulinemia 	<ul style="list-style-type: none"> Hepatitis C
<ul style="list-style-type: none"> Dermatitis herpetiformis 	<ul style="list-style-type: none"> Celiac disease
<ul style="list-style-type: none"> Sudden-onset, severe psoriasis Recurrent herpes zoster Disseminated molluscum contagiosum 	<ul style="list-style-type: none"> HIV infection
<ul style="list-style-type: none"> Severe seborrheic dermatitis 	<ul style="list-style-type: none"> HIV infection Parkinson disease
<ul style="list-style-type: none"> Explosive onset multiple, itchy seborrheic keratoses 	<ul style="list-style-type: none"> Gastrointestinal malignancy
<ul style="list-style-type: none"> Pyoderma gangrenosum 	<ul style="list-style-type: none"> Inflammatory bowel disease


@_usm

Staging of pressure ulcers

Stage	Clinical features	Illustration
1	<ul style="list-style-type: none"> Intact skin Non-blanchable with localized redness 	
2	<ul style="list-style-type: none"> Shallow, open ulcer Red-pink wound with no sloughing Possible intact or ruptured blister 	
3	<ul style="list-style-type: none"> Full-thickness skin loss with possible visible subcutaneous fat No exposed bone, tendon, or muscles 	
4	<ul style="list-style-type: none"> Full-thickness skin loss Exposed bone, tendon, or muscle 	
Unstageable	<ul style="list-style-type: none"> Full-thickness skin loss Ulcer base covered by slough and/or eschar that needs removal to stage 	

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Drug induced acne

Drug-induced acne	
	
Common triggers	<ul style="list-style-type: none"> Glucocorticoids, androgens Immunomodulators (eg, azathioprine, EGFR inhibitors) Anticonvulsants (eg, phenytoin), antipsychotics Antituberculous drugs (eg, isoniazid)
Presentation	<ul style="list-style-type: none"> Monomorphic papules or pustules Lack of comedones, cysts & nodules Location & age of onset may be atypical for acne
Management	<ul style="list-style-type: none"> Discontinue offending medication Standard acne therapy unlikely to be effective

EGFR = epidermal growth factor receptor.

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14. OBGYN

Beta hCG in pregnancy

Human chorionic gonadotropin ([hCG](#))

Site of production:

placental syncytiotrophoblast

Structure

α -subunit: common to [hCG](#), [FSH](#), [LH](#), and [TSH](#)

β -subunit: specific to the [placenta](#) (pregnancy tests measure the [\$\beta\$ -hCG](#) levels)

Function

Maintenance of the [corpus luteum](#) during the first 8–10 weeks of pregnancy ([LH](#) has a similar function)

Luteal-placental shift: levels decrease after [corpus luteum involution](#) ([placenta](#) starts synthesizing its own [estriol](#) and [progesterone](#))

Pregnancy test:

measurement of human chorionic gonadotropin (β -hCG)

Urine [\$\beta\$ -hCG](#) test (e.g., home [pregnancy test](#))

Qualitative test (less sensitive than serum [pregnancy test](#))

[\$\beta\$ -hCG](#) can be detected in urine 14 days after [fertilization](#)

Serum β -hCG test

Quantitative test (high sensitivity)

Detectable 6–9 days (on average) after fertilization

Overview		
β-hCG findings		Description
Normal		<ul style="list-style-type: none"> β-hCG concentration doubles every 2.5 days for the first 4 weeks of pregnancy. <ul style="list-style-type: none"> Peaks at 8–10 weeks of gestation (peak value ~ 100,000 mIU/mL) Decreases during the second trimester Reaches a steady level during the third trimester At β-hCG level of 1,500–2,000 mIU/mL the gestational sac will be visible with transvaginal ultrasound (if β-hCG < 1000 mIU/mL repeat β-hCG and transvaginal ultrasound after 2–3 days) ^[5]
Low	Maternal	<ul style="list-style-type: none"> Ectopic pregnancy Abortion
	Fetal	<ul style="list-style-type: none"> Edwards syndrome Patau syndrome
High	Maternal	<ul style="list-style-type: none"> β-hCG secreting tumors <ul style="list-style-type: none"> Hydatidiform mole Choriocarcinoma Multiple pregnancies
	Fetal	<ul style="list-style-type: none"> Down syndrome
False-positive		<ul style="list-style-type: none"> Recent mononucleosis infection IgA deficiency: due to heterophilic antibody formation <ul style="list-style-type: none"> Antibodies crossreact with serum beta-hCG test Urine β-hCG test should be performed as antibodies do not cross the glomerular membrane.

Ultrasound findings

Ultrasound findings in normal pregnancy (abdominal or transvaginal) ^[6]

Confirms pregnancy

At 5 weeks of pregnancy: detection of the gestational sac (corresponds with a serum β -HCG level of 1500–2000 mIU/mL)

At 5–6 weeks of pregnancy: detection of the yolk sac

At 6–7 weeks of pregnancy: detection of the fetal pole and cardiac activity with transvaginal ultrasound

At 10–12 weeks of pregnancy: **detection of fetal heartbeat with doppler ultrasound**

At 18–20 weeks of pregnancy: fetal movements

See POCUS for early pregnancy for more details.

Gestational age and estimated date of delivery

Naegele rule: used to calculate the expected date of delivery (due date)

First day of the last menstrual period + 7 days + 1 year - 3 months

Inaccurate if:

The date of the last menstrual period is uncertain or unknown

The patient has irregular menstruation cycles

The patient conceived while taking contraceptive pills

Ultrasonography

More accurate than Naegele rule

Measurement of the **crown-rump length** (CRL) in the first trimester

Measurement of **biparietal diameter**, **fetal femoral length**, and **abdominal circumference** in the second and third trimesters (can be used for determining gestational age starting at 13 weeks) ^[7]

Symphysis fundal height: the length from the top of the uterus to the top of the pubic symphysis

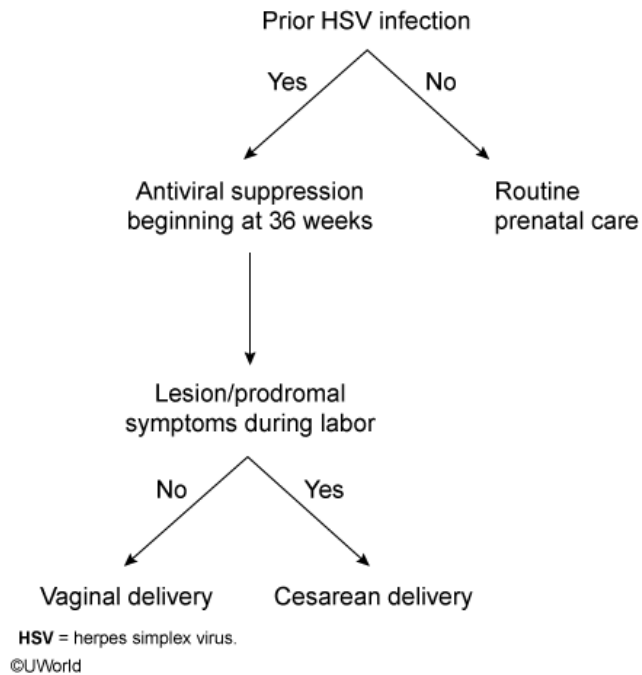
Used to assess fetal growth and development from approx. 20 weeks' gestation onwards

Development is approx. 1 cm/week after 20 weeks

Correlates with gestational age

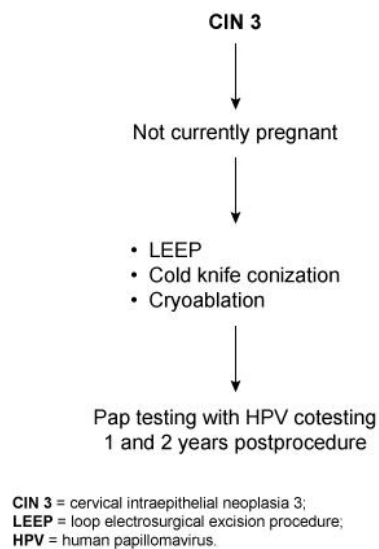
HSV in pregnancy

Pregnancy management in patients with HSV



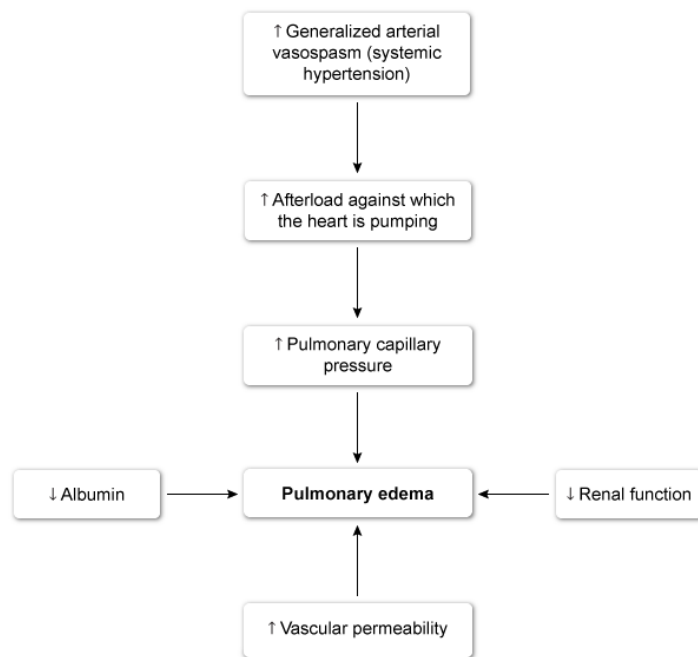
Management of CIN 3

Management of CIN 3



Pulmonary edema in preeclampsia

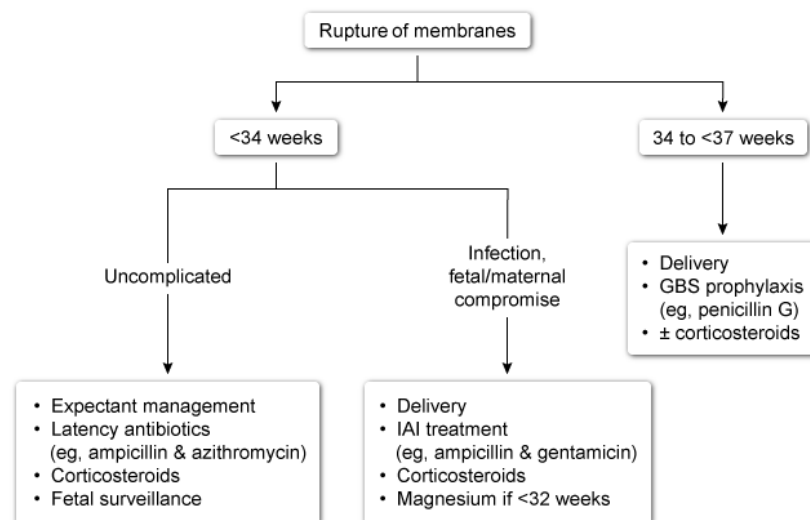
Pathophysiology of pulmonary edema in preeclampsia/eclampsia



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Management of PPROM

Management of preterm prelabor ROM



GBS = group B streptococcal; IAI = intraamniotic infection; ROM = rupture of membranes.


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Cervical cancer screening

Cervical cancer screening	
Age <21	<ul style="list-style-type: none"> No screening
Age 21-29	<ul style="list-style-type: none"> Cytology every 3 years
Age 30-65	<ul style="list-style-type: none"> Cytology every 3 years <p>OR</p> <ul style="list-style-type: none"> Cytology plus HPV testing every 5 years <p>OR</p> <ul style="list-style-type: none"> Primary HPV testing every 5 years
Age >65	<ul style="list-style-type: none"> No screening if negative prior screens & low risk
Hysterectomy (with cervix removed)	<ul style="list-style-type: none"> No screening if negative prior screens & low risk
HIV	<ul style="list-style-type: none"> Onset of sexual intercourse or time of HIV diagnosis (whichever is first) Annually until ≥3 normal results, then routine testing
Immunosuppressed (eg, SLE, organ transplant)	<ul style="list-style-type: none"> Onset of sexual intercourse Annual Pap test with HPV cotesting

HPV = human papillomavirus; SLE = systemic lupus erythematosus.

1st trimester screening

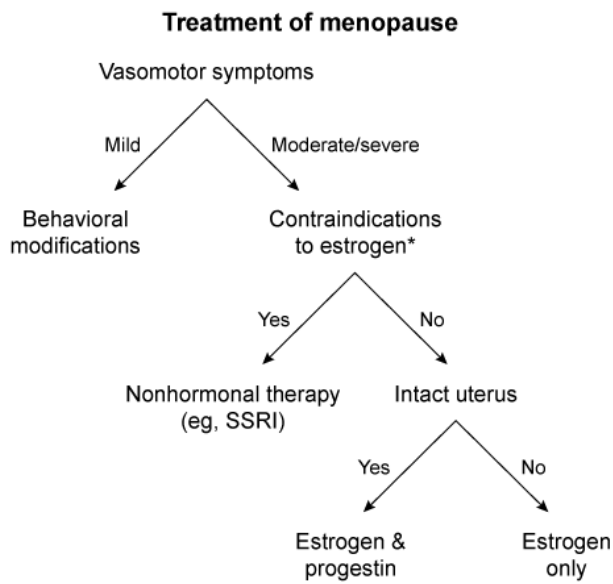
Overview of first trimester combined screening test			
Condition	HCG	PAPP-A	Nuchal translucency
Trisomy 21	↑	↓	Thickened nuchal fold (> 95th percentile) 
Trisomy 18	↓	↓↓	↑
Trisomy 13	↓	↓↓	↑
Molar pregnancy	↑↑	-	-
Ectopic pregnancy	↓	-	-

Second trimester quadruple screen

Second-trimester quadruple screening				
Diagnosis	MSAFP	β -hCG	Estriol	Inhibin A
Trisomy 18	↓	↓	↓	Normal
Trisomy 21	↓	↑	↓	↑
Neural tube or abdominal wall defect	↑	Normal	Normal	Normal

MSAFP = maternal serum α -fetoprotein.

Treatment of menopause



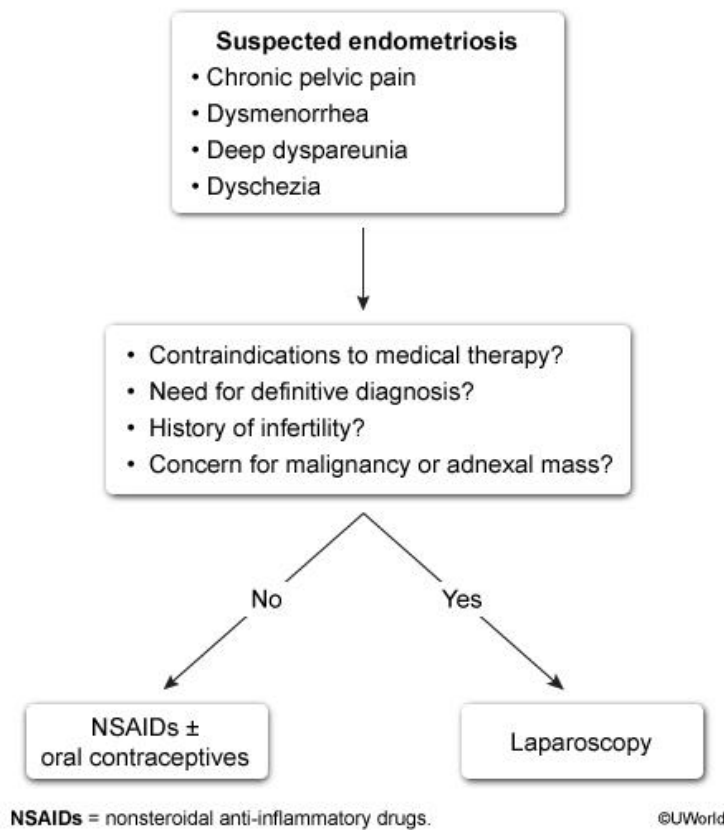
*Contraindications to estrogen: Breast cancer, coronary heart disease, endometrial cancer, liver disease, thromboembolism.

SSRI = selective serotonin reuptake inhibitor.

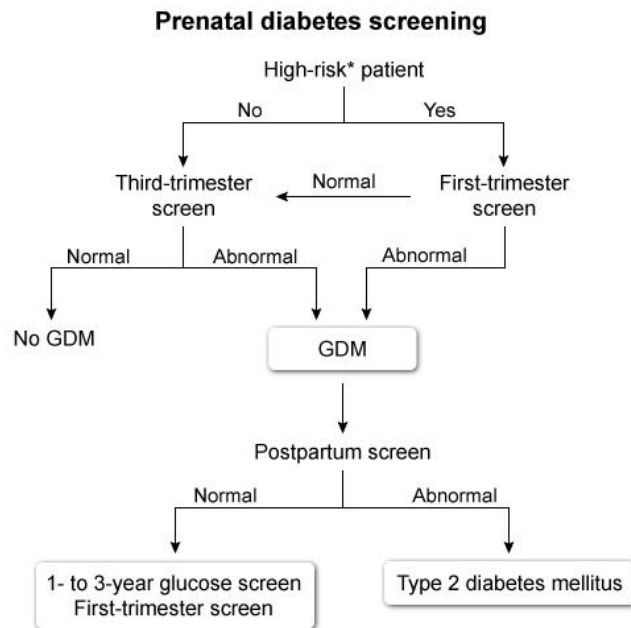
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Management of endometriosis

Management of endometriosis



Prenatal diabetes screening

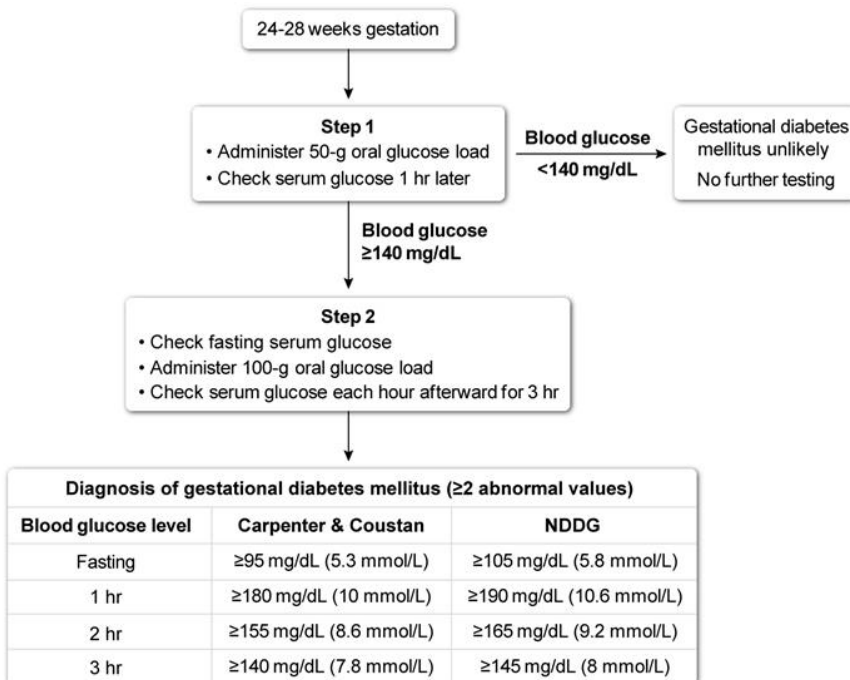


*Obesity **plus** ≥1 of the following: prior GDM, prior macrosomic infant, family history (first degree), polycystic ovary syndrome, age ≥40.

GDM = gestational diabetes mellitus.

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2-step approach for screening & diagnosing gestational diabetes mellitus

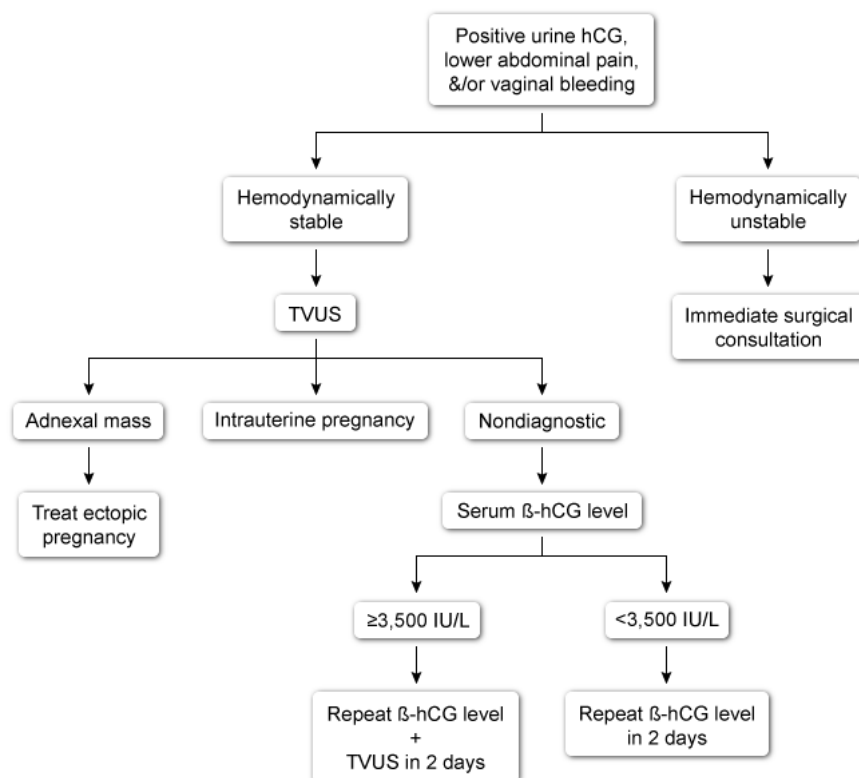


NDDG = National Diabetes Data Group criteria.

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Management of suspected ectopic pregnancy


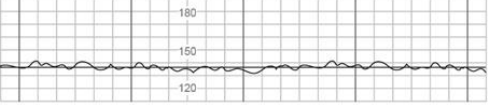
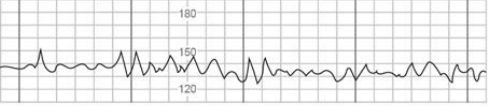
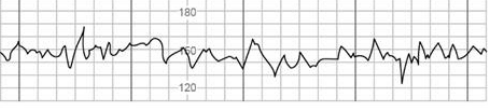
Management of suspected ectopic pregnancy



TVUS = transvaginal ultrasound.

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Fetal heart rate monitoring

Fetal heart rate variability	Clinical significance
Absent: undetectable amplitude 	Abnormal or intermediate pattern Etiology: <ul style="list-style-type: none"> • CNS depressants (narcotics, alcohol, recreational drugs)
Minimal: ≤5 bpm 	<ul style="list-style-type: none"> • Temporary fetal sleep • Prematurity • Fetal hypoxia
Moderate: 6-25 bpm 	Normal pattern
Marked: >25 bpm 	Unclear significance

CNS = central nervous system.

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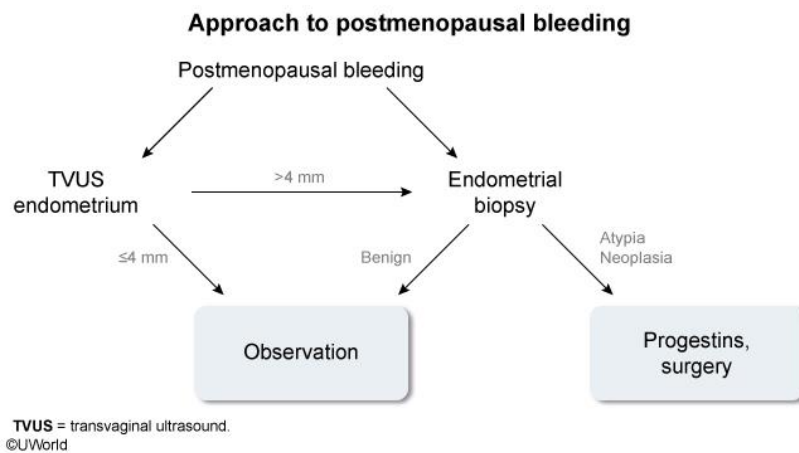
Intrapartum fetal heart rate monitoring		
Early	Relationship to contraction <ul style="list-style-type: none"> Symmetric to contraction Nadir of deceleration corresponds to peak of contraction Gradual (≥ 30 sec from onset to nadir) Etiology <ul style="list-style-type: none"> Fetal head compression Can be normal fetal tracing 	
Late	Relationship to contraction <ul style="list-style-type: none"> Delayed compared to contraction Nadir of deceleration occurs after peak of contraction Gradual (≥ 30 sec from onset to nadir) Etiology <ul style="list-style-type: none"> Uteroplacental insufficiency 	
Variable	Relationship to contraction <ul style="list-style-type: none"> Can be but not necessarily associated with contractions Abrupt (< 30 sec from onset to nadir) Decrease ≥ 15/min; duration ≥ 15 sec but < 2 min Etiology <ul style="list-style-type: none"> Cord compression Oligohydramnios Cord prolapse 	

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Intrapartum fetal heart rate monitoring

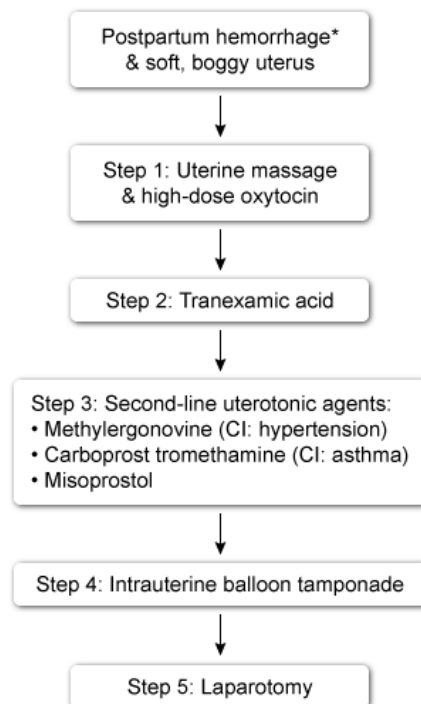
Fetal heart rate tracing patterns	
Category I	Requires all the following criteria: <ul style="list-style-type: none"> Baseline 110-160/min Moderate variability (6-25/min) No late/variable decelerations \pm Early decelerations \pm Accelerations
Category II	<ul style="list-style-type: none"> Not category I or III (indeterminate pattern)
Category III	≥ 1 of the following characteristics: <ul style="list-style-type: none"> Absent variability + recurrent late decelerations Absent variability + recurrent variable decelerations Absent variability + bradycardia Sinusoidal pattern

Postmenopausal bleeding



Management of postpartum uterine atony

Management of postpartum hemorrhage due to uterine atony

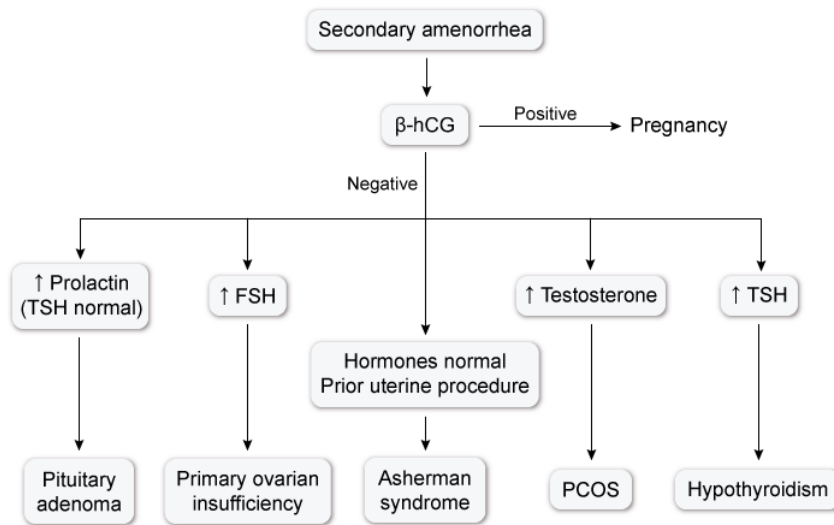


*Estimated blood loss $\geq 1,000$ mL or bleeding + hypovolemia.
CI = contraindication.

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Secondary amenorrhea

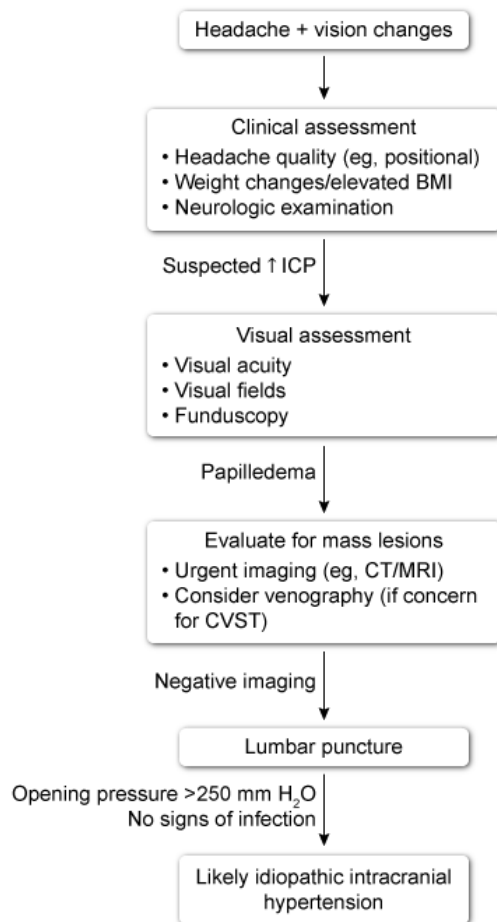
Secondary amenorrhea evaluation



PCOS = polycystic ovary syndrome.
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Suspected idiopathic intracranial hypertension

Evaluation of suspected idiopathic intracranial hypertension

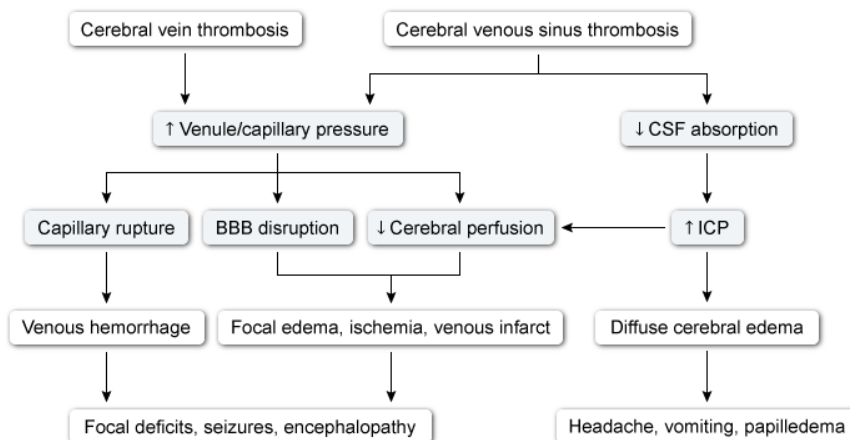


CVST = cerebral venous sinus thrombosis; ICP = intracranial pressure.

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Suspected cerebral vein thrombosis

Pathophysiology of cerebral vein and venous sinus thrombosis*

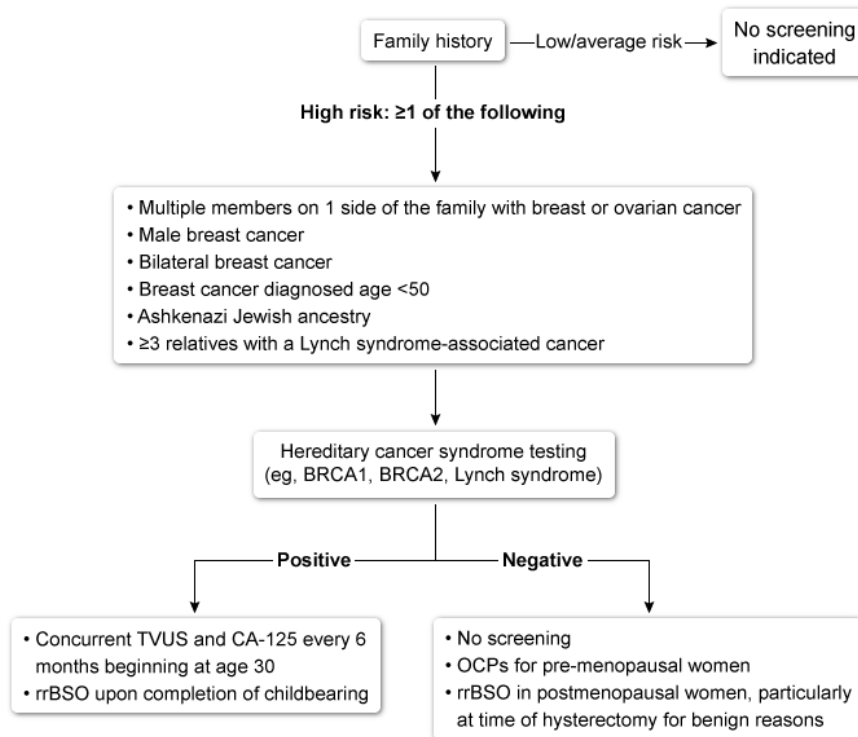


*Presentation highly variable and often mixed depending on thrombus location/distribution.
BBB = blood-brain barrier; CSF = cerebrospinal fluid; ICP = intracranial pressure.

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Risk based ovarian cancer screening

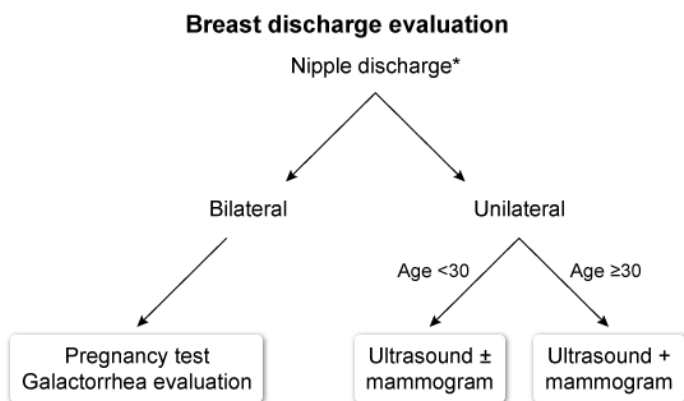
Risk-based ovarian cancer screening & management



OCP = oral contraceptive pill; rrBSO = risk reducing bilateral salpingo-oophorectomy;
TVUS = transvaginal ultrasound.

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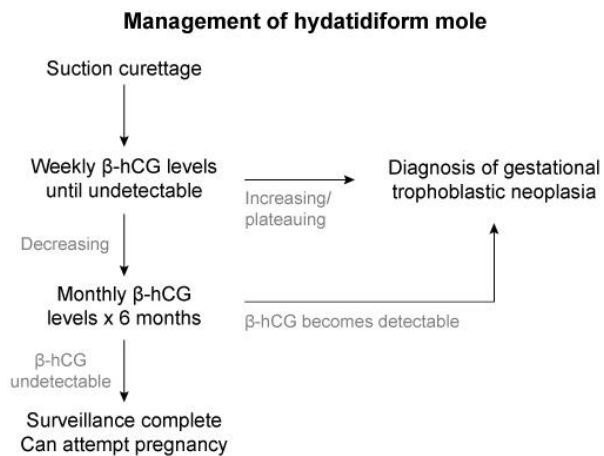
Breast discharge evaluation



*Nonbloody discharge & normal breast examination
(eg, no masses, lymphadenopathy, or skin changes).

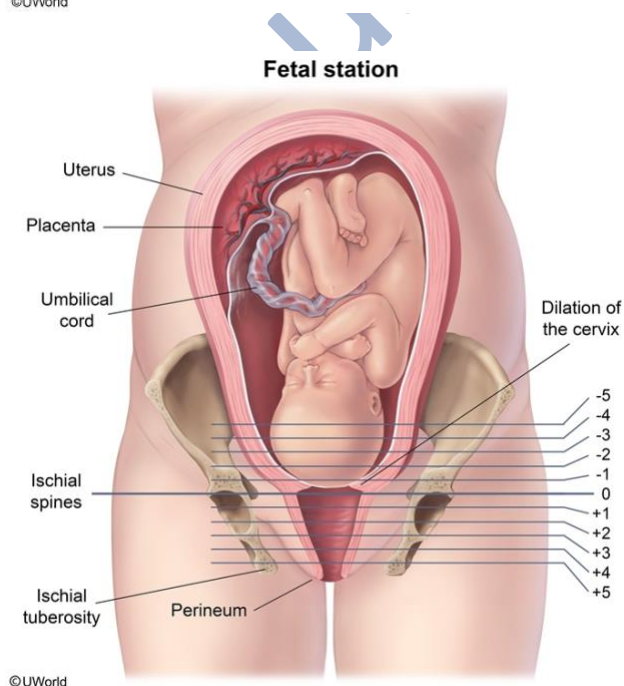
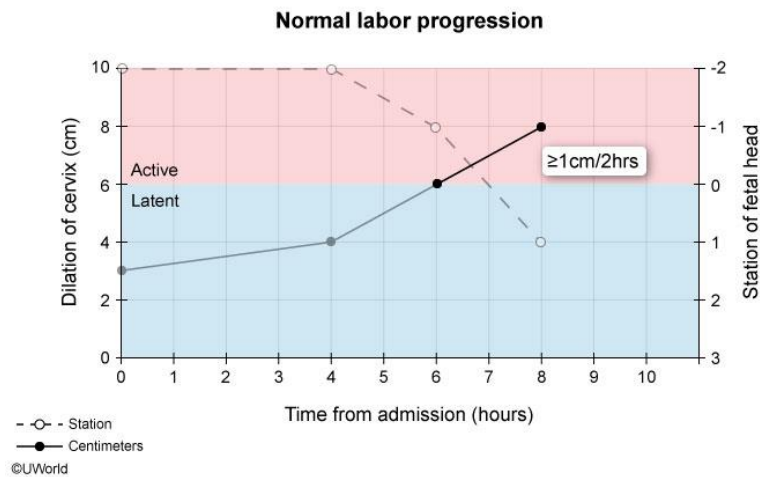
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Management of hydatidiform mole



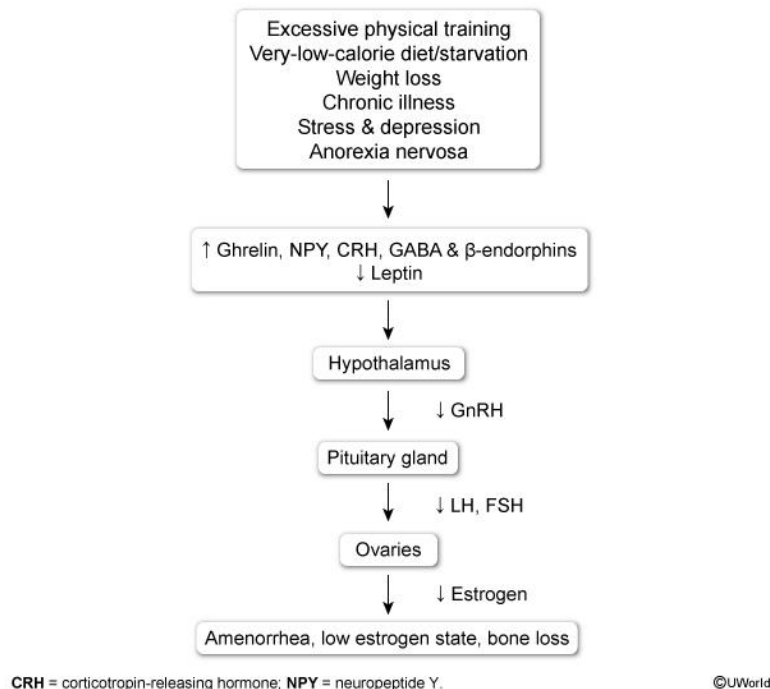
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Normal labor



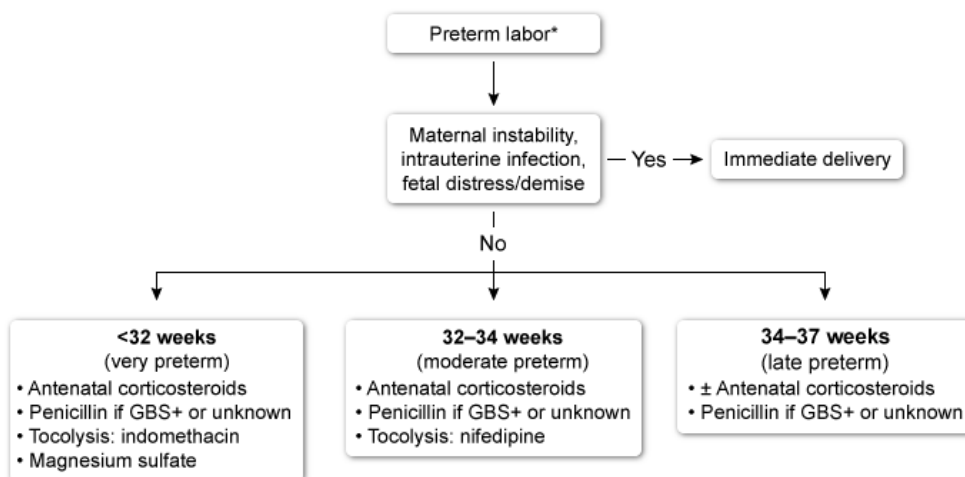
Functional hypothalamic amenorrhea

Pathophysiology of functional hypothalamic amenorrhea



Preterm labor management

Preterm labor management

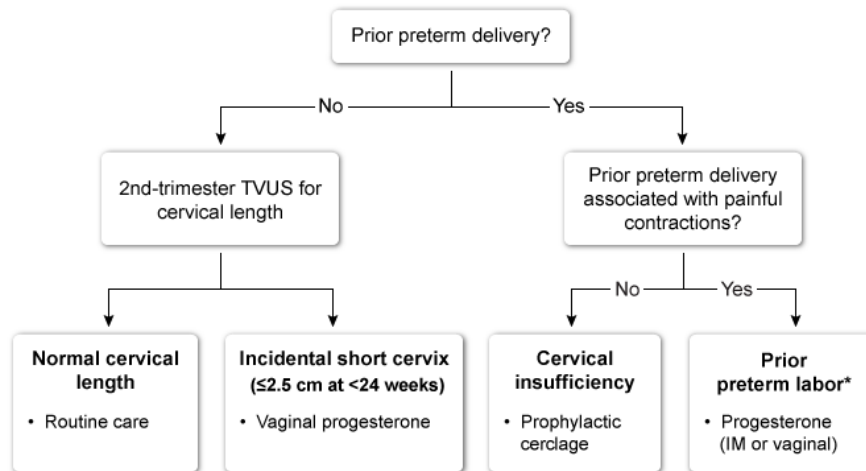


*Preterm labor = regular contractions causing cervical change at <37 weeks gestation with intact membranes.
GBS = group B *Streptococcus*.

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Preterm birth management

Preterm birth prevention

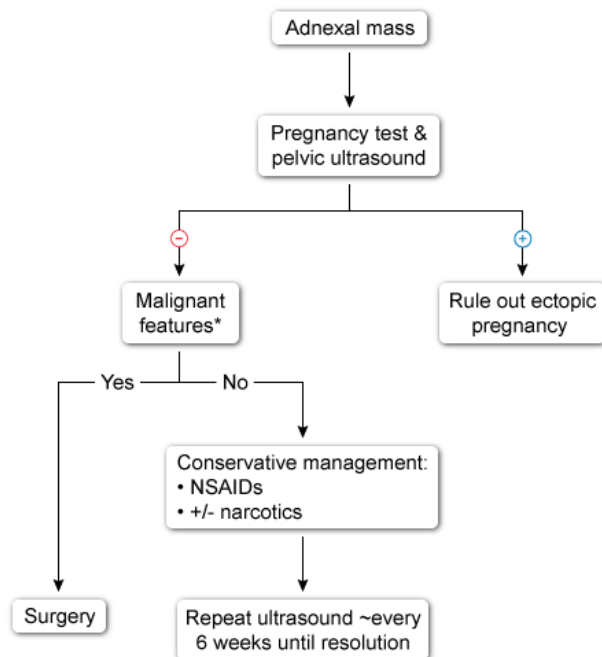


*Preterm labor = regular contractions causing cervical change at <37 weeks gestation with intact membranes.
IM = intramuscular; TVUS = transvaginal ultrasound.

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Premenopausal adnexal mass evaluation

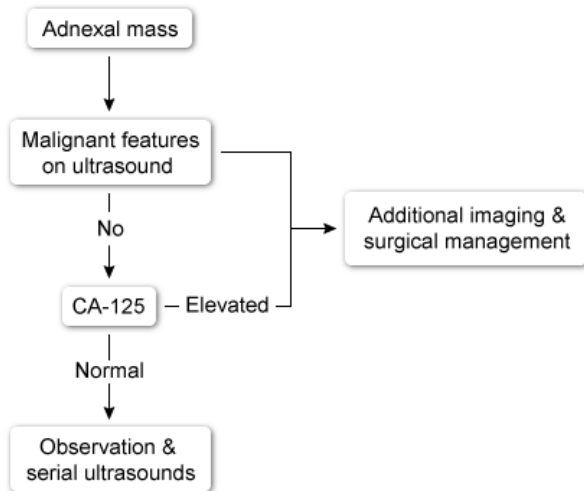
Premenopausal adnexal mass evaluation



*Complex, solid components, septations, calcifications, increased vascularity. ©UWorld

Postmenopausal adnexal mass evaluation

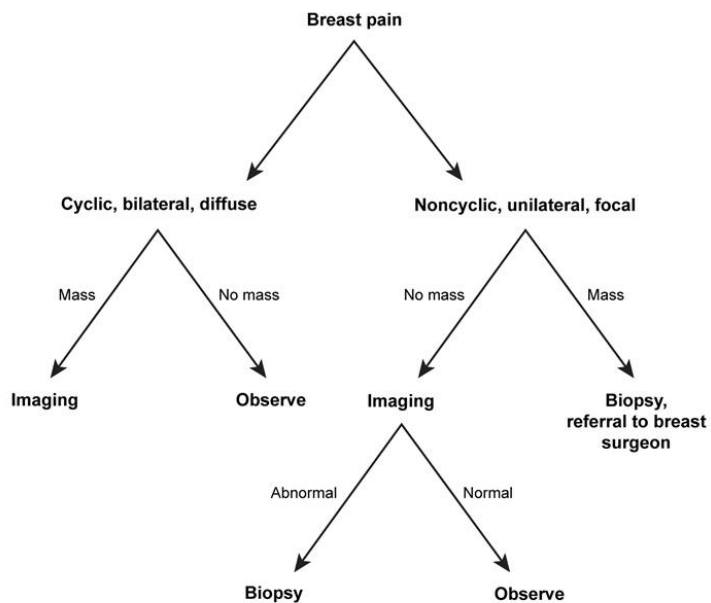
Postmenopausal adnexal mass evaluation



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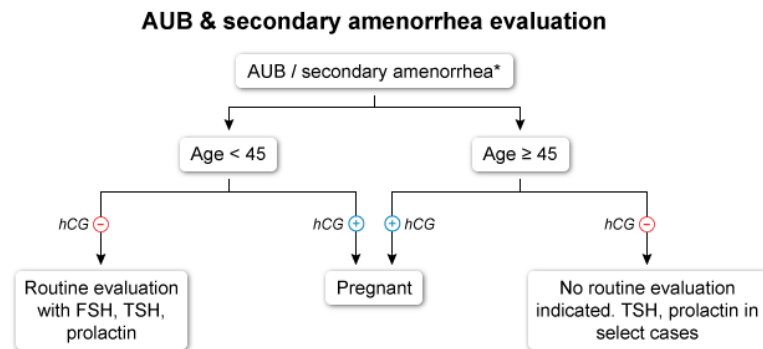
Management of breast pain

Management of breast pain



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Secondary amenorrhea and AUB evaluation



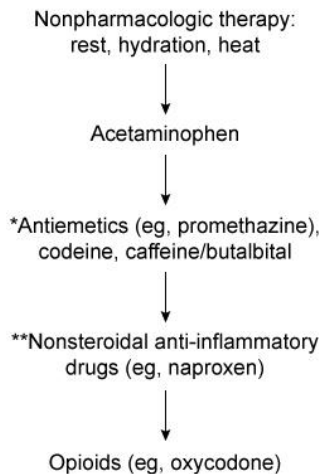
AUB = abnormal uterine bleeding.

*Secondary amenorrhea = no menses >3 months with prior regular menses
OR no menses >6 months with prior irregular menses.

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Management of migraines in pregnancy

Management of migraines in pregnancy



*Can be used in conjunction with acetaminophen.

**2nd trimester only.

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Evaluation of polyurea

